REPORT

ON THE

MEASUREMENT OF RATES OF GROWTH

OF

CASUARINA IN THE NELLORE DISTRICT.

MADRAS:
PRINTED BY E. KEYS, AT THE GOVERNMENT PRESS.
1884.

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REPORT ON THE MEASUREMENT OF RATES OF GROWTH OF CASUARINA IN THE NELLORE DISTRICT.

By D. E. HUTCHINS, *Deputy Conservator of Forests, on Special Duty, dated Madras, 7th March* 1883.

THE work, of which I have now the honor to submit the report, was begun on the 26th January. I arrived at Nellore on the 20th instant, unfortunately to find the Collector and the Wood Overseer both absent in the district. The Collector returned to Nellore on the 24th instant and the Wood Overseer joined me on the 28th. I have to thank Mr. Lee-Warner for every assistance and Somasundram Mudaliar for valuable aid rendered during the whole time that I remained in the district. This report consists, *first*, of a brief description of each of the plantations visited; *second*, a short discussion of the different values obtained of Form-factors of Acre-increments and of Individual-increments.

2. A statement appended, supplied by the Jungle Conservancy Department, gives the locality, size, age, and other particulars of the Casuarina plantation in the Nellore District. It will be noticed in this statement that the oldest of the plantations of large size, and of which the age is certain, having been planted by the Jungle Conservancy Department is not more than nine years of age; and the history of that year's planting is a melancholy one. The planting in that year was done 9 feet × 9 feet, a distance which may be looked on as approaching the minimum distance at which Casuarinas can be planted if it is to yield a good Acre-increment without severe thinning. After the 9 feet × 9 feet planting was finished, an order came from the Collector to put in intermediate planting, one plant between every two, thus reducing the planting to $4\frac{1}{2}$ feet × $4\frac{1}{2}$ feet and quadrupling the number of trees per acre. It is a marked property of Casuarina that the tree is intolerant of shade, and thus this intermediate planting, being a year younger than the original 9 feet × 9 feet planting, was in great measure suppressed by the first planting. But the difference in age being usually not more than a year, the suppression was only partial, and the result is now that the nine years old planting all through the district presents a bad appearance, and is too irregular to afford Sample-areas to determine the rates of growth of closely-grown Casuarina at that age. Thus the oldest of my Sample-areas, taken from large blocks of planting, are only eight years of age. The rates of growth at other ages were determined as opportunity offered, as is detailed in speaking of each plantation separately. The subsequent year's plantings in the large plantations up to three years ago is all at this strange distance apart of $4\frac{1}{2}$ feet × $4\frac{1}{2}$ feet, or 2,178 to the acre, so that all the Sample-areas taken in the large plantations labor under the defect of having been planted excessively close.

3. On the 26th January I visited the *Alipuram* plantation with the Collector. This plantation is fifteen years of age, 11 miles inland, and favorably situated in the bed of the Pennér river. Unfortunately I found that all the good trees had been felled and the remaining stock poor and too irregular for the determination of rates of growth.

4. I then proceeded north by canal to the *Utakur* and *Varni* plantations. Those were the first plantations I had seen of the very close planting that has been followed in the Nellore District. I was very unfavorably impressed with their appearance, and proceeded further north to the *Tumalapenta* plantation before beginning measurements.

The *Utakur* and *Varni* plantations, which are close together, and practically one plantation, are on the landward side of the Buckingham Canal, and rather farther from the sea than the other large plantations. The growth in these plantations is regular; the older planting looks the better at *Utakur*, the younger at *Varni*,

but how the trees have been dwarfed by overcrowding in these plantations is evident from a comparison between the sizes of the trees on the margin and of inner trees. Here, as in all the plantations, a striking feature is the improved growth of trees round the margin of wells. These wells are cup-shaped, about 4 yards in diameter, and from 4 to 10 feet deep, according to the level of the subsoil water. They are scattered throughout the whole area of the Casuarina plantations, sometimes so thickly as to occupy about one-fifth of the area. On an average from one-tenth to one-twentieth of the total area of the Coast Casuarina plantations is occupied by wells. The trees fringing the wells are usually nearly double the general size of the trees around. The wells being of small diameter, the large fringing trees close, and there is thus little or no break in the canopy, and consequently no real loss of area from the plantation. Four causes probably tend to promote the very remarkable growth of these trees fringing the wells :—*First*, increased space; *second*, a slightly higher level of subsoil moisture; *third*, the effect of a pit in mixing the earth; *fourth*, the evaporation from the surface of the wells mitigating the dry land wind. The first reason is of obvious importance. A glance at the Individual-increment shown in these tables will show how the growth of individual trees has suffered from overcrowding. At the Dugarázpatnam plantation the average cubic contents of the margin trees was to the average cubic content of the inner trees. As regards the second reason, the slightest rise in the level of the soil and consequent lowering of the level of subsoil water is everywhere marked by a less favorable growth, and it is probable that the surface of the water within the wells is higher than the water level outside the wells. As regards the third reason, one of the several undoubted advantages of pitting in planting is the thorough mixing of the soil; the large trees around the wells are on a mixed soil composed largely of the soil thrown up from a depth of 6 to 10 feet in digging the well. In support of the fourth reason, it may be noticed as apparently established that a strip of Casuarina planting exposed on one side to the moist sea breeze, on the other to the dry land wind, has the better growth on the sea side.

The stacking of firewood in the Varni and other plantations is done with commendable neatness. The cost of carriage of firewood from Varni to Madras, 118 miles, is only Rs. 3 per ton, the firewood selling in Madras at Rs. 10 per ton; preparation costs on an average Annas 12 per ton. Even roots can be stubbed up, sent to Madras from this distance, and sold at a small profit. It is remunerative also to send to the Madras market twigs and the smallest wood, which is done up into neat bundles convenient for stowing on the boats.

5. From *Utakur* I proceeded north to the *Tumalapenta* plantation, which is at the 110th milestone of the Buckingham Canal: a long narrow strip of planting stretching for 1½ miles along the dunes of the coast, within 50 yards of the sea; soil, the deepest and whitest of loose sand. *Tumalapenta* is a typical coast plantation. The subsoil moisture, judging from the water in the wells, is here at a depth of 1 or 2 feet more than the average of other plantations visited. To this, and to the uniformly poor silicious soil, it is probably due that the growth in the *Tumalapenta* plantation is less rapid, but more regular than in that of any other plantation visited. *Tumalapenta* is the only plantation in which the whole of the planted area may be reckoned on as equal to the Sample-area. The plantation consists of three blocks of planting aggregating 49 acres, five, seven and nine years old, respectively, and of eight small experimental plots of planting, particulars of which are given in the jungle conservancy statement appended to this report. Of these experimental plots, three, which had been wide planted, and which show now a regular growth, were measured, the Sample-areas being taken as large as the size of the plots permitted. In the three large blocks of planting, Sample-areas of an acre each were taken, the ages being well graduated—five, seven, and nine years, respectively. The Sample-areas measured are referred to as A, B, C, D, E, F.

Sample Area A of Tumalapenta.

6. This plot is one of those originally planted as an experiment, in order to test the best distance apart for planting by Mr. Atkinson, then an Assistant Collector. Mr. Atkinson's plot was half an acre in extent. I laid off a rectangle inside this so as to avoid the margin trees, and obtained a plot uniformly stocked with an

area of 0·42436 acre. A special interest attaches to the three Sample-areas A, B, and C of the *Tumalapenta* plantation, in that they are the only portions of the Government plantations in the Nellore District which are not overcrowded, and are at the same time sufficiently regular to afford an Acre-increment. Though the stock here is regular, and the figures obtained are undoubtedly good and trustworthy, yet the Sample-areas are small. Throughout this work in the Nellore District it has been a source of regret that there was not more wide planting to measure. With regard to close planting, as will appear in the course of this report, the figures obtained are as copious as could be desired. In the Nílgiri Eucalyptus and in the Mysore Casuarina tables a summary of the results obtained is entered at the head of each table of stock. In this report on the Coast Casuarinas the summary will be found transferred to the body of the report for facility of reference. The summary of the results obtained from the measurement of Sample-area A of the *Tumalapenta* plantation is accordingly entered here.

Summary of Table of Stock on the Sample-area, and of the Factor Table of A, Tumalapenta. Plantation, 5½ years of age, planted in 1877.

Sample-area 0·4244 acres, now carries 285 trees per acre.

—	Dimensions of Trees.			Form-factors.	
	Girth in Inches.	Height in Feet.	Cubic Content in Cubic Feet.		
Maximum	27	46	11·02	0·65	Form-factor used 0·57.
Mean	18·69	43·74	5·16	0·57	
Minimum	9	24	0·61	0·50	

Growth (yearly).

Individual-increment in Cubic Feet.	Acre-increment in Tons (dry wood with bark).
0·93794	5·981

It almost invariably happens in a close plantation of trees of the same age that the Form-factor of the exceptionally tall trees which dominate the others is below the average; these trees run up to a point, and consequently have very high ideal cylinders, while their true cubic contents may not be much above the average. The Form-factor being the true cubic content divided by the Ideal-cylinder, it follows that the Form-factor of dominating trees is usually below the average of the trees around. Now a mean Form-factor may be taken, first, from the average of the Form-factor of each tree; second, in a general and more correct way by dividing the total of true cubic contents by the total of Ideal-cylinders. This second value for the average Form-factor is the most correct, since each tree then influences the general figure in proportion to its size. Thus the largest trees have the largest influence on the general average, and having themselves low Form-factors, the second value of a mean Form-factor is (exceptional circumstances apart) lower than the first value (on this subject, *vide* Nílgiri Eucalyptus Report). In Sample-area A of *Tumalapenta* it will be noticed that the first value, contrary to rule, is a very small fraction, 0·01 below the second value. I can detect no flaw in the figures, and account for this circumstance by the influence exercised by two trees of rather exceptional form—Nos. (8) and (10) on the small number of Factor trees taken here. Though of large size—in fact (10) has double the average cubic content—their height is not above the average, a result attributable probably to wind, Sample-area A being within 200 yards of the sea.

Sample Area B.

7. Sample-area B of the *Tumalapenta* plantation is similar to A in every respect, except that it is two years younger. There is one blank in A, the tree having been blown down in the last cyclone; there are three blanks in B. B was planted by

the Jungle Conservancy Department. A is rather above a foot apart, more sparsely planted than B, and it will be noticed afterwards that A gives better figures than B, both in the average dimensions of its trees and in its figures of growth.

The high maximum Form-factor is caused by one tree which had been broken by the wind.

Summary of Table of Stock on the Sample-area, and of the Factor Table of B, Tumalapenta. Plantation, 3½ years of age, planted in 1879.

Sample-area 0·4802 acres, now carries 383 trees per acre.

—	Dimensions of Trees.			Form-factors.	
	Girth in Inches.	Height in Feet.	Cubic Content in Cubic Feet.		
Maximum	16	37	2·93	0·91	Form-factor used 0·67.
Mean	10·15	29·86	1·24	0·68	
Minimum	4	15	0·09	0·53	

Growth (yearly).

Individual-increment in Cubic Feet.	Acre-increment in Tons (dry wood with bark)
0·35370	3·052

Sample Area C of Tumalapenta.

8. Sample-area C of *Tumalapenta* having the oldest and tallest trees in the plantation, it has suffered to a considerable extent from wind. Five trees altogether in the Sample-area have had their tops broken by the wind. No. 4 in the Factor table has a curious form expressed by the fraction 0·34; it is a tree broken at about the middle, but which afterwards made a long thin shoot from where it was broken off to nearly the average height of the trees around. With little head and a slender stem the Form-factor of this tree is the fraction which expresses a cone. The remaining nine trees show a regular form, the Form-factor varying only between 0·48 and 0·59. It may be estimated perhaps that wind has reduced the Acre-increment in Sample-area C by about one-half or one-third of a ton. C was planted by the Salt Department.

Summary of Table of Stock on the Sample-area, and of the Factor Table of C, Tumalapenta. Plantation, 9 years of age, planted in 1873 *at* 10½ *feet* × 10½ *feet.*

Sample-area 0·1739 acres, now carries 374 trees per acre.

—	Dimensions of Trees.			Form-factors.	
	Girth.	Height.	Cubic Content.		
Maximum	31	60	16·89	0·59	Form-factor used 0·53.
Mean	17·58	44·87	4·61	0·53	
Minimum	7	26	0·37	0·34	

Growth (yearly).

Individual-increment in Cubic Feet.	Acre-increment in Tons (dry wood with bark).
0·51196	4·514

Sample Area D of Tumalapenta.

9. Sample-area D of Tumalapenta plantation was the first close planting measured. Unlike the rest of the planting of that year in the district, it was planted at one time. It shows consequently a regular growth, and was measured. The nine years old planting elsewhere, as has been already explained, is too irregular to measure for the Acre-increment. Like the rest of the close planting, D is planted 4½ feet + 4½ feet. Being on a poor soil, the ill-effects of such close planting are here most striking. The trees have a stunted appearance, and are small both in girth and in height. The margin trees are about treble the size of the interior trees, and of a healthy appearance and good shape. In both this Sample-area and the next E a thinning done six months ago has taken out half the stock, every intermediate tree having been cut. This severe thinning has covered the whip-like stems with clusters of small shoots in both D and E to a less extent in E than in D, E being two years younger, and thus having suffered less from overcrowding. The thinnings in both D and E are calculated in the usual form for the period at which they occurred. Probably in great measure owing to the covert, few of the trees cut six months ago have thrown up coppice shoots from their stumps. The stools with shoots were enumerated, the result being that 371 had thrown up coppice shoots out of 829 trees cut. There occurred in the Sample-area 103 blanks in the planting and 126 dominated trees under 3 inches in girth. Only two had apparently been broken by the wind.

Summary of Table of Stock on the Sample-area, and of the Factor Table of D, Tumalapenta. Plantation, 9 years of age, planted in 1873 at 4½ feet × 4½ feet.

Sample-area 1·00 acres, now carries 829 trees per acre; up to six months ago 1,658 trees per acre.

—	Dimensions of Trees.			Form-factors.	
	Girth in Inches.	Height in Feet.	Cubic Content in Cubic Feet.		
Maximum	16	48	2·91	0·68	Form-factor used 0·52.
Mean	8·27	32·98	0·75	0·52	
Minimum	3	13	0·04	0·41	

Growth (yearly).

Individual-increment in Cubic Feet.	Acre-increment in Tons (dry wood with bark).
0·08536	3·058

Sample Area E of Tumalapenta Plantation.

10. E, the next Sample-area measured, calls for no remark, it being similar to the preceding but two years younger. The covert and appearance of the grown are better than in the case of D, the trees having been overcrowded for a shorter time. It should be explained that the form given to the Sample-area in D, in E, and in the other masses of large close planting was a band running through the centre of the best stock on the ground. This band was uniformly 10 chains in length by 1 chain in breadth. It happened in E and in some other Sample-areas that it was found impossible to get a strip of even this moderate width without encountering wells. Where the presence of these wells caused any break in the canopy, the blanks in the canopy were estimated in the field and allowed for in the calculation. E having been cut over in the same manner and at the same time as D, the stools which had thrown up coppice shoots were enumerated. Out of 921 trees cut, 103 stools had thrown up coppice shoots. It should be mentioned that the trees felled were cut flush with the ground. Shoots from flush stools give the best coppice, but it appears that Casuarina coppices better if cut about 2 feet above the ground. There is a remarkably fine piece of coppiced Casuarina at the 36th and 37th mile-

stones of the Buckingham Canal. It is part of a large area owned by a Burman, and stretches north along the dunes beginning at the boundary of the Chingleput District. The trees are stated to have been cut when fifteen years of age, and the coppice shoots to be now four years of age. From the canal this plantation has the appearance of being composed of ordinary planted trees. In the plantation the stools are found furnished with tall clumps of coppice shoots, recalling the appearance of clumps of bamboos. In other places the superabundant shoots having been cut, the stool carries a fine tree between 30 and 40 feet high. The stools here were cut 2 feet above the ground, saws being used to guard against injury to the bark. On an average about half the stools are said to have furnished shoots, the casualties being on the higher drier portion of the dunes. There were in Sample-area E 18 blanks in the planting and 65 dominated trees below 3 inches in girth.

Summary of Table of Stock on the Sample-area, and of the Factor Table of E, Tumalapenta. Plantation, 7 years of age, planted in 1875 at 4½ feet × 4½ feet.

Sample-area 1·00 acres, now carries 921 trees per acre; up to six months ago 1,842 per acre.

—	Dimensions of Trees.			Form-factors.	
	Girth in Inches.	Height in Feet.	Cubic Content in Cubic Feet.		
Maximum	14	41	2·55	0·77	Form-factor used 0·59.
Mean	7·49	28·78	0·60	0·60	
Minimum	3	10	0·03	0·42	

Growth (yearly).

Individual-increment in Cubic Feet.	Acre-increment in Tons (dry wood with bark).
0·08574	3·384

SAMPLE AREA F OF TUMALAPENTA PLANTATION.

11. In situation this is the same as the other two plots of close planting D and E. The appearance of the growth is as superior to E as E is to D; F being both planted farther apart and two years younger than E, it does not appear to have suffered much from overcrowding. It will be noticed that the Individual-increment is better than in E in spite of the trees being two years younger; the Acre-increment is less on account of the low age of F, only five years.

Summary of Table of Stock on the Sample-area, and of the Factor Table of F, Tumalapenta. Plantation, 5 years of age, planted in 1877 at 6 feet × 6 feet.

Sample-area 1·00 acres, now carries 1,066 trees per acre.

—	Dimensions of Trees.			Form-factors.	
	Girth.	Height.	Cubic Content.		
Maximum	12	37	1·62	0·76	Form-factor used 0·60.
Mean	7·46	27·22	0·54	0.60	
Minimum	3	14	0·04	0·37	

Growth (yearly).

Individual-increment in Cubic Feet.	Acre-increment in Tons (dry wood with bark).
0·10834	2·567

12. The plantations to the north of *Tumalapenta* being small, young, and of uncertain age, having been planted by the Salt Department, from *Tumalapenta* I proceeded south, visiting all the Government Casuarina plantations as far as the boundary of the Nellore District, north of Pulicat. Passing *Utakur* and *Varni* plantations, which have already been noticed, I arrived on the 9th February at the Kistnapatam plantation.

KISTNAPATAM PLANTATION.

13. This, the oldest Government plantation on the coast, is situated within a mile of the Nellore basin on the Buckingham Canal. It is a small plot of only 5 acres, originally planted by the Salt Department, and which, from the information furnished by the records of that department, is proved to be now nineteen years and four months old. Originally planted 30 × 30, and with now many gaps in the planting, these trees have from the beginning been entirely isolated the one from the other, most of them branch low; some are stag-headed and physically mature already. The subsoil moisture appears to be scanty, and the growth of the trees generally poor and irregular. Ten of the best were measured and gave an Individual-increment of 2·08857 cubic feet.

Summary of Table of Stock of the Kistnapatam Plantation, 19·3 *years of age, planted in November* 1863 *at* 30 *feet* × 30 *feet.*

Ten trees only measured.

	Dimensions of Trees.			
	Girth in Inches.	Height in Feet.	Cubic Content in Cubic Feet.	Form-factor used 0·55.
Maximum	52	78	52·96	
Mean	44·70	66·20	40·31	
Minimum	39	60	30·97	

Growth (yearly).

Individual-increment in Cubic Feet.

2·08857

14. From *Kistnapatam*, at the 91st milestone of the canal, I proceeded to *Taminapatnam* at the 87th milestone. This is a fine plantation, with trees of all ages, from nine years downwards, situated about a mile south of the mouth of the river which falls into the sea near the Nellore canal basin. It occupies a strip of flat sand lying immediately within the sand dunes. The dunes themselves are now being planted and fixed. In one place the drifting sand has invaded the plantation, burying the old Casuarina trees to a depth of 10 or 15 feet without apparently in any way injuring their growth. Two solitary Casuarinas, whose origin is unknown, growing entirely unprotected amongst the sand hills, about midway between the sea and the plantation, show a vigorous and suggestive growth. Within the *Taminapatnam* plantation the growth is superior to that in the *Tumalapenta* plantation, but less regular. The water in the wells here is at a depth of between 3 and 4 feet from the surface, while at *Tumalapenta* it was between 5 and 7. For the first 50 yards, just within the dunes, the growth is admirable; it then becomes patchy, and in the older planting there are large glades of from a quarter to one acre in extent, where the only trees remaining are those fringing the wells. In one of these glades I had pits sunk to a depth of from 3 to 5 feet, in order to investigate the cause of the death of the trees. These pits revealed nothing; the soil was the same, and the subsoil water at the same level

as outside the glade, where the Casuarina showed a good growth. The Wood Overseer attributed the death of these trees to the scorching effect of the land wind, a conclusion which I hesitate to adopt, but which is supported by the general shape of the glades, which are long, running east and west, and opening out landwards. I regret that the time at my disposal did not permit of deeper pits being sunk. In *Taminapatnam* two Sample-areas were taken, each an acre in extent, and sixty Factor trees in each Sample-area. I was unwilling here to break through the practice of taking Sample-areas an acre in extent, but there being nearly 2,000 trees to the acre, the stock tables were exceedingly long and laborious; in the next plantation measured, *Kottapatam*, it was found that time did not permit of taking Sample-areas larger than half an acre.

Sample Area A of Taminapatnam Plantation.

15. In *Taminapatnam* the two Sample-areas taken were—A, five years of age, and B, seven years of age. These were the only two years' planting that admitted of measurement. The planting nine years of age was spoilt by subsequent intermediate planting; that eight years of age was irregular in growth and broken into glades; there were a few fine trees only four years of age, but the growth was too irregular to furnish a Sample-area. The younger planting in this plantation is very creditable to the Jungle Conservancy Department, and being 9 feet × 9 feet, will in a few years be a valuable property. In A there were 99 blanks in the planting and 180 suppressed trees under 3 inches in girth. Of the 99 blanks, 21 were caused by wells.

Summary of Table of Stock on the Sample-area, and of the Factor Table of A, Taminapatnam. Plantation, 5 years of age, planted in 1877 at 4½ feet × 4½ feet.

Sample-area 1·00 acres, now carries 1,949 trees per acre.

—	Dimensions of Trees.			Form-factors.	
	Girth in Inches.	Height in Feet.	Cubic Content in Cubic Feet.		
Maximum	22	53	8·64	0·78	Form-factor used 0·61.
Mean	6·63	31·30	0 58	0·61	
Minimum	3	10	0·04	0·44	

Growth (yearly).

Individual-increment in Cubic Feet.	Acre-increment in Tons (dry wood with bark).
0·11582	5·035

Sample Area B of Taminapatnam Plantation.

16. This, as has been already mentioned, is similar to A but two years older. While A is equal throughout to the Sample-area, less than half the area of B is equal to the fine growth through which the Sample-area was run; this fine growth extends for but a short distance inwards from the line of sand hills; elsewhere in B the growth is not above that which was measured in Sample-area E at *Tumalapenta*, or, in other words, the Acre-increment falls from 5 tons to 3 tons. That the trees in B were of exceptionally regular form will be noticed on running the eye down the 60 Form-factors shown in the Factor table. Here, as in the other Sample-areas, the Factor trees were selected from a row of trees running along the middle of the Sample-area from end to end, so that the trees, of which the forms are shown in the Factor table, represent the actual form occurring

throughout the length of the Sample-area. It will be noticed that the Factor trees often vary gradually: the higher Factors, the form more nearly approaching a cylinder, at one end of the table; the lower, those approaching a cone, at the other end. This is, of course, due to the differences in character of the stock, through which passes the Sample-area in the form of a long band. In B there were 214 blanks in the planting and 124 suppressed trees under 3 inches in girth. Of the 214 blanks, 33 were caused by wells.

Summary of Table of Stock on the Sample-area, and of the Factor Table of B, Taminapatnam. Plantatim, 7 years of age, planted in 1875 at 4½ feet × 4½ feet.

Sample-area 1·00 acres, now carries 1,832 trees per acre.

—	Dimensions of Trees.			Form-factors.	
	Girth in Inches.	Height in Feet.	Cubic Content in Cubic Feet.		
Maximum	24	62	8·78	0·79	Form-factor used 0·60.
Mean	7·90	35·24	0·91	0·61	
Minimum	3	5	0·04	0·51	

Growth (yearly).

Individual-increment in Cubic Feet.	Acre-increment in Tons (dry wood with bark)
0·13016	5·299

KOTTAPATAM PLANTATION.

17. From *Taminapatnam* I proceeded 10 miles south to the *Kottapatam* plantation, which is approached by a backwater turning off from the canal. *Kottapatam* is considered to show the best growth of any of the coast plantations; it was selected to be shown to the Duke of Buckingham on his journey up the canal. Taken as a whole, there is little difference in growth between the *Kottapatam* and the *Taminapatnam* plantations; the nine years old planting is equally irregular in both, but a portion of the eight years old planting in the former is without doubt the best that can be viewed in any of these close plantations. The Sample-area selected represents the best of this planting, and it will be observed that the figures obtained are higher than those of any other Sample-area in close planting, viz., an Individual-increment of 0·19 of a cubic foot and an Acre-increment of 6⅓ tons. Sample-area A is eight years of age; Sample-area B adjoins it, is a year younger, and shows a slightly inferior growth. The soil of both A and B is 4 or 5 feet of sand, then a bed of shell, and below this alluvial black clay and fine sand deposited by the backwater. It is doubtless to this mixed soil that the Casuarina owes its fine growth. The clay is at a depth where it is always moist, and it and the shells supply those mineral constituents which are absent in a purely silicious soil.

Sample Area A of Kottapatam.

18. The area of Sample-area A and of the next, B, is half an acre each, half an acre being taken instead of an acre on account of the high number of trees per acre in this close planting. But very little reduction was made in the number of the Factor trees, which were here 50 instead of 60 as in the one acre Sample-areas. In A there were 89 blanks in the planting and 138 suppressed trees below 3 inches in girth. Of the 89 blanks, 20 were caused by wells.

Summary of Table of Stock on the Sample-area, and of the Factor Table of Kottapatam, A Plantation, 8 years of age, planted in 1874 *at* 4½ *feet* × 4½ *feet.*

Sample-area 0·50 acre, now carries 1,520 trees per acre.

—	Dimensions of Trees.			Form-factors.	
	Girth in Inches.	Height in Feet.	Cubic Content in Cubic Feet.		
Maximum	27	76	14·23	0·73 (0·65)	Form-factor used 0·57.
Mean	8·97	38·99	1·49	0·58	
Minimum	3	5	0·04	0·50	

Growth (yearly).

Individual-increment in Cubic Feet.	Acre-increment in Tons (dry wood with bark).
0·18631	6·293

SAMPLE AREA B OF KOTTAPATAM PLANTATION.

19. As in the preceding, Sample-area B represents the better portion of the stock in the seven years old planting; a considerable portion of the remaining stock is poor, and there are glades where the trees have died out entirely. As in the Taminpatnam plantation, the young planting at Kottapatam, 9 feet × 9 feet, is of excellent appearance. In B there were 101 blanks in the planting and 126 suppressed trees below 3 inches in girth.

Summary of Table of Stock on the Sample-area, and of the Factor Table of B, Kottapatam. Plantation, 7 years of age, planted in 1875 *at* 4½ *feet* × 4½ *feet.*

Sample-area 0·50 acre, now carries 1,542 trees per acre.

—	Dimensions of Trees.			Form-factors.	
	Girth in Inches.	Height in Feet.	Cubic Content in Cubic Feet.		
Maximum	23	68	9·30	0·75	Form-factor used 0·57.
Mean	8·16	35·68	1·09	0·59	
Minimum	3	6	0·04	0·50	

Growth (yearly).

Individual-increment in Cubic Feet	Acre-increment in Tons (dry wood with bark).
0·15588	5·342

SAMPLE AREA C OF KOTTAPATAM PLANTATION.

20. Within a few hundred yards of the *Kottapatam* plantation, on the landward side of the dunes, with a perpetual spring of fresh water on one side, is a clump of generally well-grown Casuarina trees, planted by some fishermen ten years ago round their village. The village was deserted during the famine, and now only the trees remain. I found on inspection that these trees were too irregularly placed to be put into a Sample-area, and were therefore simply measured for their Individual-increment. Ten out of the number were felled and the Form-factor determined. Curiously, this proved to be almost the same as the Form-factor from

the two Sample-areas in the close planting; all three worked out to an average of ·57. I have found it on other occasions difficult to estimate the Form-factor of margin trees. Ordinarily, it would be expected that a margin tree would have a form between the cylindrical shape of the closely-grown pole and the conical shape of the tapering isolated tree. Often, however, margin trees have a pole-like stem, and develop an ample head afterwards when they have quite shaken themselves free of the trees on one side. The combination of a cylindrical stem and an ample branching head gives, of course, a very high Form-factor. In appearance these well-developed trees on the old village-site are a great contrast to the poles of the close planting. Comparing Individual-increments it will be seen that the average growth of the trees in C is exactly ten times that of the average growth of the close planting by its side in Sample-area B, and B, it will be borne in mind, is far above the general average of the close planting. B has, in fact, given the second best figures of growth of all the Sample-areas in the closely-planted plantations. As will be noticed, the same ratio exists comparing the Acre-increments of sparse planting at 200 to the acre and of dense planting 2,000 to the acre; good planting of both kinds will yield the same Acre-increment of 5 tons, so that ten trees in the dense planting do no more work than one tree in the sparse planting. Near these Casuarinas on the old village-site I counted eight or ten self-sown Casuarina seedlings, suggestive of natural forest of Casuarina; but the locality is rather exceptionally favorable, with the loose sand of the dunes and a spring of fresh water 2 feet below the surface.

Summary of Table of Stock on the Sample-area, and of the Factor Table of Kottapatam, C Plantation, 10 *years of age, planted in* 1872 *irregularly round some fishermen's huts.*

—	Dimensions of Trees.			Form-factors.	
	Girth.	Height.	Cubic Content.		
Maximum	43	70	34·45	0·63	Form-factor used 0·57.
Mean	28·48	59·96	15·56	0·57	
Minimum	20	45	5·92	0·51	

Growth (yearly).

Individual-increment in Cubic Feet.	Acre-increment in Tons (dry wood with bark).
1·55549	...

DUGARAZPATNAM PLANTATIONS.

21. From *Kottapatam* I proceeded south to *Dugarázpatnam*, at the 69th milestone of the canal. There is here a large plantation of dense planting skirting the backwater. On the whole this planting is inferior to much that I had seen and already measured, nor did it appear that there was anything further to be learnt by taking more measurements of dense planting. The usual remarkable difference in dense planting between inner trees and margin trees seemed accentuated here. In the lower portion of the Government planting at *Dugarázpatnam*, whether owing to flooding by salt water or a saline soil, the growth is poor and glades are numerous.

Dugarazpatnam A.

22. This was a small piece of private planting on wet assessed land, carefully manured and tended; the figures shown below are approximate only on account of the few trees measured and the possibility that the information given of the age of the planting may not be quite accurate, but the growth was very regular, and it is probable that had a whole acre been measured the figures would have varied but

little from these. They show what growth may be expected with abundant manure and water at even such an early age as three years :—

Summary of Table of Stock on the Sample-area, and of the Factor Table of Dugarázpatnam. A Plantation, 3 years of age, planted in 1879 at 6 feet × 6 feet.

Sample-area 0·0322 acres, now carries 1,180 trees per acre.

	Dimensions of Trees.			
	Girth in Inches.	Height in Feet.	Cubic Content in Cubic Feet.	Form-factor used 0·60.
Maximum	13	36	2·02	
Mean	7·66	28·50	0·62	
Minimum	3	12	0·04	

Growth (yearly).

Individual-increment in Cubic Feet.	Acre-increment in Tons (dry wood with bark).
0·20789	5·452

Dugarazpatnam Isolated Trees.

23. Going south, *Dugarázpatnam* is the last of the Government plantations; it remained then but to measure some large trees planted in a row by the side of the canal. These trees are in a prominent position, and their age was known to the Wood Overseer and to people on the spot. The trees lower down the canal were remembered to be twenty years of age from the fact that they were planted when the first kandam on the *Sríharikót* Island was cut. The trees termed *Dugarázpatnam* B extend for about a mile along the canal bank; some of them appeared to be on bad soil and showed but a poor growth. Of 189 trees measured, 11 were stag-headed, and the gaps in the original row of trees represented almost as many trees as are now there. Good and bad were measured together with the following results :—

Summary of Table of Stock of the Dugarázpatnam B (Canal) trees, 20 years of age, planted in 1862 at 15 feet apart in one row.

	Dimensions of Trees.			
	Girth in Inches.	Height in Feet.	Cubic Content in Cubic Feet.	Form-factor used 0·50.
Maximum	71	85	91·99	
Mean	38·01	48·74	23·68	
Minimum	20	30	5·53	

Growth (yearly).

Individual-increment in Cubic Feet.	Acre-increment in Tons (dry wood with bark).
18,406	...

Sriharikot Isolated Trees.

24. Fifteen miles further south, near the kasba village of the island of *Sríharikót*, were some Casuarina trees growing in a broken row by the side of the canal and of the Pulicat lake. They were planted by Mr. Fraser, the Engineer of

the canal. Of the same age as the preceding, they showed a far better growth. These trees are growing close to the edge of the salt water on a rich mixed alluvial soil—that of the *Sriharikót* Island. The Individual-increment which they have yielded, approaching 4 cubic feet, is a figure which will be noticed and compared with others in considering below the figures of growth which have been obtained. Some of these trees are of very remarkable size. The tree with the maximum cubic content in the statement below is 74 inches in girth and 97 feet in height. It cubes 146·77 cubic feet = 3·262 tons, and has an Individual-increment of 7·34 cubic feet. The highest Individual-increment from a Nílgiri Blue-gum on record is 12 cubic feet, which also is from a tree grown isolated :—

Summary of Table of Stock of the Sriharikót Canal trees, 20 years of age, planted in 1862 at 15 feet apart in one row.

	Dimensions of Trees.			
	Girth in Inches.	Height in Feet.	Cubic Content in Cubic Feet.	
Maximum	76	99	146·77	Form-factor used 0·50.
Mean	56·90	77·85	71·95	
Minimum	44	57	36·38	

Growth (yearly).

Individual-increment in Cubic Feet	Acre-increment in Tons (dry wood with bark)
3·600	...

FIGURES OF GROWTH.

Acre-increment.

25. The following form, used in the Nílgiri Eucalypt Report and in the Mysore Casuarina Report, exhibits the various figures of growth brought together on one sheet. Of eight Sample-areas of close planting measured, the highest Acre-increment obtained was that yielded by the piece of show planting at *Kottapatam* plantation, viz., 6·29 tons; the lowest, that yielded by the young planting at *Tumalapenta*, viz., 2·567 tons. The average of the eight Sample-areas of close planting is 4·554 tons. These Sample-areas are samples of the best and most complete stock in each plantation. The average yield for close planting may be taken as not exceeding 3 tons per acre per annum. The Sample-areas of D, E, and F of *Tumalapenta* very fairly represent the average growth, and the average Acre-increment of these three Sample-areas is exactly 3 tons.

The three Sample-areas of wide planting, viz., A, B, and C of *Tumalapenta* are, in fact, all the regular wide Government planting in the Nellore District, and the average of these three areas, viz., 4·515 tons, must be reckoned as below the average growth, since there was no selection in these areas, and the growth in the *Tumalapenta* plantation, though regular, is the poorest of the plantations measured. The average of the three Sample-areas of close planting at *Tumalapenta* is as much as 2·481 tons below the average of the close planting in the Sample-areas of other plantations, which is 5·484 tons. Thus, for wide planting 4½ tons may be taken as the average Acre-increment for poor growth on the dunes and about 7 tons on better soil.

TABLE OF ACRE-INCREMENTS.

Showing the Growth of Casuarina on the Coast.

Plantations.	Area of Plantations in Acres.	Age of Sample-area in Years.	Elevation in Feet.	Area of Sample-area in Acres.	Number of Trees per Acre now on the ground.	Form-factor used.	Actual Stock now on the ground per Acre. Cubic Feet.	Yearly Individual-increment (actual). Cubic Feet.	Yearly Acre-increment (calculated tons of dry wood).	Details of Acre-increment. Standing Stock	Blanks in Canopy.	Previous Thinnings.		Remarks.
Tumalapenta A	53	5½	7·0	0·4244	285	0 57	1469·98	0·93794	5 981	5·940	0·041	..	Sparse planting.	Sparse planting in three small plots which were measured *in toto*.
Do. B		3½	..	0·4802	282	0·67	474·52	0·35370	3·052	3·013	0 039	..		
Do. C		9	..	0·1739	374	0·53	1722·25	0·51196	4·514	4·252	0 262	..		
Do. D		9	..	1·00	(a) 829	0·52	636·91	0·08536	3·058	1·573	..	1·485	Dense planting	(a) Half the stock cut out six months ago, planted 4½ feet × 4½ feet
Do. E		7	..	1·00	(a) 921	0·59	552·78	0·08574	3·384	1·755	..	1·629		(b) Planted 6 feet × 6 feet.
Do. F		5	..	1·00	(b) 1,066	0·60	577·47	0·10834	2·567	2·567	..	..		
Taminapatnam A	390	5	5·0	1·00	1,949	0·61	1128·74	0·11582	5 035	5·017	0·018	..		Planted 4½ feet × 4½ feet.
Do. B		7		1·00	1,832	0·60	1169 2	0·13016	5·299	5·299	..	..		
Kottapatam A	290	8	6·0	0·50	1,520	0·57	2265·60	0·18631	6 293	6·293	..	..		
Do B		7	..	0·50	1,542	0 57	1682·60	0·15588	5·342	5·342	..	..		
Dugarázpatnam A	4	3	5·0	(c) 0·0322	1,180	0 60	736·02	0 20789	5·452	5·452	..	..		(c) The figures relating to this Sample-area are approximate only
Kottapatam C	1	10	..	..	..	0·57	..	1·55549	..	..	..	..	Isolated planting.	Margin trees.
Kistnapatam	5	17	12·0	0·0	..	0·55	..	2·8700	..	..	..	..		Isolated trees.
Dugarázpatnam B	..	20	5·0	..	..	0·50	..	1·18406	..	..	..	..		
Sríharikót	..	20	5·0	..	..	0·50	..	3 6000	..	..	..	..		

For close planting the above figures may be considered to be as complete as there is any object in making them, they being averages taken from the measurement of 8,166 trees and of 6·0322 acres. For wide planting more measurements are necessary. The 5 Acre-increments from the Mysore Casuarina plantations all relate to very wide planting done 15 × 15, in which, strictly speaking, some allowance should be made for the first six or eight years, or until the trees close. This would raise the best Mysore Casuarina Acre-increment to 7 or 8 tons, and theoretically I see no reason why this Acre-increment should not be realized in the case of Casuarina planted on good soil with abundant subsoil moisture and spaced 12 × 12, either on the Mysore plateau or the Madras Coast. Within the limits of my experience the growth of Casuarina does not perceptibly vary for elevations up to 3,000 feet. There are a few well-grown Casuarinas on the Nundydroog Hill near Bangalore at an elevation of 4,600 feet, but the growth at that elevation is observably less than at the plateau level, which is there 3,000 feet above the sea. In West Mysore the tree flourishes in a few situations, where it has been planted up to a rainfall of 40 inches. Beyond this, on coffee estates the growth is not good; but I believe Mr. Dickinson is planting Casuarina successfully at 4,000 feet and in the heavy rainfall of Mercara in Coorg. The lower the elevation, the more severe must be the transpiration from an ever-green and a rapid grower, such as Casuarina. On the deep red loams of the Mysore plateau, where the level of well water is 30 or 50 feet below the surface, Casuarina exhibits a growth nearly equal to that on the mixed alluvial soils of the Madras seaboard (the Sríharikót Island for example) and superior to the average of growth on the sand dunes of the coast. With moderate subsoil moisture in Mysore, as in Sample-areas A of Kadgodi and Nelal plantations (*vide* Mysore report on rate of growth of Casuarina) the growth is equal to the best Coast Casuarina. Generally the Mysore Casuarina plantations are on bare or scrub covered plains, where the subsoil moisture in the dry season is at a great depth, and it is a remarkable fact that in the terrible droughts of 1876 and 1877 the casualties amongst these trees were practically nil.

The ages of the Government Casuarina plantations in the Nellore District are too low to admit of deducing from the Acre-increments, which is the most profitable age at which to fell Casuarina; and the unskilful treatment these plantations have received would render a maximum Acre-increment impossible, whatever the age at which the growths were examined.

A measurement of 110 trees in a private plantation south of Madras made by Mr. Lushington under Dr. Brandis' direction yielded an Acre-increment of 3½ tons at thirteen years of age. The following figures were furnished by Mr. Wooldridge, Deputy Conservator, to Dr. Brandis, and handed over by the latter to me when I was placed on special duty measuring the figures of growth of Casuarina. It will be observed that I calculate an Acre-increment of 4·518 tons at eight years from Mr. Wooldridge's figures. Judging from the description given of the plantation, a like result would have been produced by a "cubage" or measurement of standing stock. If figures such as those furnished by Mr. Wooldridge were recorded systematically for large areas, and over a term of years, the data would be valuable, especially in the case of Casuarina, which has a regular growth, is usually cropped early, felled nearly clean, and sold on the spot by weight. Otherwise, and notably in the case of any special inquiry, it is less tedious and more accurate, even in the case of the youngest trees, to measure the stock standing than to fell and weigh it.

Individual-increments.

26. In planting such as that in Nellore, which has been maintained at the rate of 2,000 trees to the acre, the Individual-increments are so small that they may be passed over, with the observation that the poorest is 0·085 cubic feet in D and E of the *Tumalapenta* plantation, and the best 0·186 cubic feet in the show planting at A of the *Kottapatam* plantation.

In the three Sample-areas of wide planting at *Tumalapenta* it will be observed, and the fact is significant, that the Individual-increment varies exactly with the sparseness of the planting in spite, too, of the difference of ages, in two cases. A calculation of the approximate yield of the Shonangcupam Casuarina plantation on

the sea-coast, near Cuddalore, south of Madras. Soil, a fine sand 8—12 feet deep, thin clay, with occasional beds of shells. Fresh water at 6 feet below the surface in the hot weather.

The plantation was planted in 1873, pruned during the first four years, and a few poles thinned out during the fourth year. It was thinned again during the sixth and seventh years, and cut over finally when eight years of age, leaving on foot 220 standards (=10 per acre), estimated to contain 23 tons.

Thinnings.

Date of Felling	Number and Sort of Trees felled	Age when felled	Sort of Wood obtained.	Quantity T	CWTS.	LB	Amount realized by Sales. RS	A	I	Amount in Tons increased by Interest at 4 per cent (Compound Interest) till the period of the Final Cutting
1874	6,000 saplings pruned	1	Twigs and brushwood .. .	1	0	0				1 316
1875	2,321 casualties ripped out	2	Faggot wood .	6	0	0	59	0	0	7 590
1876	860 do do ..	3	Do	5	0	0				6 085
1877 ..	10,000 pruned.. ..	4	Do and twigs	4	0	0				4 680
	500 selected poles ..	4	Loppings ..	3	0	0				3 510
August 1879 ..	1,710 selected	6	Timber	28	0	0	125	0	0	32 760
December 1880 ..	3,187 do	7	Billets and faggot wood	78	2	0	292	14	0	84 404
			Billets 13,445 ..	100	0	0	400	0	0	104 000
			383 head-loads of loppings	8	11	0	12	5	0	8 890
			Ends rejected as billets, 5,038 pieces .	11	3	0	45	13	11	11 596
				244	16	0	935	0	11	264 831

Final Cutting.

Area felled in Acres	Date of Felling	Number and Sort of Trees felled.	Age of Wood when felled	Sort and Quantity of Wood obtained	Amount realized by Sales RS	A	P.	Tonnage
22 3/6 There were 220 trees left as standards, estimated to contain 23 tons, at date of clean felling and a fair coppice growth still on hand.	From November 1881 to February 1882	8,860 seedlings planted in 1873, viz ,3,036 under 1 foot in girth at 5 feet high and 5,824 trees over 1 foot girth	7	67 poles sold at 5 annas the cubic foot ..	71	2	1	5
				Firewood in billets, 46,226 .	1,471	0	0	490 25
				Loppings and heads of trees .	80	0	0	23
				Side roots ..	7	0	0	2
		4,658 coppice shoots from 943 roots of 1865 planting	8	Firewood in billets ..	819	0	0	273
				Loppings, &c	45	0	0	15
					2,493	2	1	808 25

Calculation of Acre-increment.

		TONS.
Thinnings	=	264·831
Final cutting	=	808·250
Standards left on the ground	=	23·000
Total stock on 22·3 acres	=	1096·081
Stock per acre = 1096·081 ÷ 22·3	=	49·151
Increment per acre per annum $\frac{49\ 151}{8}$	=	6·144

This refers to wood about one month seasoned; to convert to tons of dry wood 6·144 × $\frac{50}{68}$* = 4·518 tons of dry wood.

* Wood, green with bark, being 70 lb per cubic foot, and Coast Casuarina, dry with bark, 50 lb. per cubic foot.

A, with the highest Individual-increment, is half the age of B with the next highest figure. It hardly needs remark that while Acre-increments rise slowly, remain at a maximum and decline slowly, Individual-increments should rise rapidly during the whole period of a tree's growth up to the period of its physical maturity, when the foliage becomes scanty and the crown stag-headed.

Amongst the margin and isolated trees are some good Individual-increments. The row of trees planted by the side of the Buckingham Canal a few miles below Dugarázpatnam have an increment of a little more than a cubic foot at twenty years of age. The trees classed as margin trees, planted by the fishermen on the dunes around their village, exhibit a good figure of growth in an Individual-increment of a foot and-a-half at ten years of age. The next on the list is 2·37 cubic feet from the isolated trees in the old Casuarina plantation at *Kistnapatam*. Lastly, the giants on the *Sríharikót* Island, with the remarkably high Individual-increment of 3·6 cubic feet of average growth at twenty years of age. Amongst the Nílgiri Eucalypts the highest Individual-increment obtained was 4·3 cubic feet from Blue-gum standards over wattle coppice, no purely isolated Blue-gums having been measured. Over $3\frac{1}{2}$ cubic feet for the Individual-increment of Casuarina is undoubtedly a surprising figure, and shows the decided preference of the tree for ample space and room to develop. Casuarina should be planted sparse, and in the after-thinnings it should ever be borne in mind that the nearer the tree is kept *almost isolated*, the better will be the two figures of growth—the Acre-increment and the Individual-increment. The Nílgiri figures presented the same conclusion for the Blue-gum, while to a moderate extent the reverse appeared to be true for the shade-bearing *Acacia melanoxylon*.

Form-factors.

27. This part of the Nellore work will be found to be exceptionally strong. In the Mysore Casuarina work the proportion of Factor trees to trees measured was greater than in the Nílgiri work, as it appeared from the first that the Casuarina Form-factors were not likely to prove as regular as had been the Blue-gum Form-factors. The Blue-gum tree grown in close plantations presents the curious feature of having a Form-factor only 0·02 higher at five years of age than at twenty years of age. Practically the Form-factor for close plantations of Blue-gum from five to twenty years of age is 0·45. At five years of age the blue-gum is already a small tree, while the Casuarina (unpruned) takes the form of a bush. Bushes have high Form-factors. Pruning by cutting off the lower branches, or natural pruning by close planting, gives Casuarina a more tree-like and conical form, lowering the Form-factor. The Form-factors for Casuarina obtained in the Mysore work showed a decline from as high as 0·72 for young bushy trees to 0·53 for trees eleven years of age planted 15 × 15. The same progression may be noticed in the Nellore Casuarina Form-factors, but to a less marked degree, the trees being reduced by crowding to a form approaching a cylindrical pole crowned by a scanty head of leaves. Thus, in the dense planting at *Tumalapenta* we have 0·60, 0·59, and 0·52 at the ages of five, seven, and nine years. In the dense planting at *Tuminapatnam* 0·61 at five years, 0·60 at seven years. In the dense planting at *Kottapatam* 0·57278 at seven years and 0·56667 at eight years. With the exception of *Tumalapenta* D, which at nine years has the abnormally low factor 0·52, these results exhibit a satisfactory uniformity, a uniformity due, no doubt, to the general regularity of growth in these plantations and the large number of measured trees on which the figures are founded. The exception in *Tumalapenta* D is explainable from the fact of those trees having suffered to the extent that their crowns are almost destroyed by overcrowding; the ill-appearance of these trees is noticed in the description of that portion of the plantation. Leaving aside these abnormal trees, we have the following average Form-factors for different ages in close planting at $4\frac{1}{2} \times 4\frac{1}{2}$:—

At five years of age the Form-factor is $\frac{0{\cdot}60185 + 0{\cdot}60690}{2}$ = 0·60437

At six years (interpolating) the Form-factor is = 0·59598

At seven years of age the Form-factor is $\frac{0{\cdot}5931 + 0{\cdot}5969 + 0{\cdot}57278}{3}$ = 0·58759

At eight years of age the Form-factor from one Sample-area is ... ... = 0·5667

At nine years of age the Form-factor may be assumed at about ... ... = 0·545

After this age, unless the trees were thinned, they would begin to lose their crowns as has happened at *Tumalapenta* D, where the Form-factor has sunk to 0·5231.

In the sparse planting the Form-factors stand thus :—

At 3½ years of age	0·67
At 5½ „ „	0·57
At 9 „ „	0·53

Thus, as Casuarina trees grow older, provided they have room to develop, the Form-factor becomes less. In exceptional cases the fall is very rapid, thus in very wide, or in isolated planting on poor soil, a low bushy form gives Form-factors as high as 0·72 and above 1·0 in extreme cases; at fifteen or twenty years of age the trunk of isolated Casuarinas becoming very tapering and the crown very scanty, the Form-factor sinks to 0·45, 0·50, or perhaps lower, but measurements of old isolated trees are required in order to determine this point accurately. In very close planting (4½ × 4½) the Form-factor falls less rapidly than in wide planting, but in extreme cases, where the close planting has destroyed or much reduced the heads of the trees, we have seen that the Form-factor may fall to 0·52. Planting 12 feet × 12 feet and thinning afterwards, so as to maintain the trees moderately close, would probably yield Form-factors falling gradually from 0·65 at five years of age to ·55 at fifteen or twenty years of age. Planting 15 × 15 the Form-factor would be slightly higher at first, and depends afterwards on the thinning. Of the isolated trees measured, only those at *Kottapatam* C could conveniently be felled to determine the Form-factor. These gave an unexpectedly high figure, but they belong to the class of tree-form which is usually found on the margin of plantations. If isolated on both sides, their Form-factor would doubtless have proved lower.

Average Dimensions of the Trees measured.

28. The following statement shows the average dimensions of the trees measured brought together on one sheet. Ordinarily, in studying the growth of plantations, the average height at different ages is an important figure which has to be considered ; but in the case of Casuarina, which practically is grown exclusively for firewood, the average height of the stock is quite subordinate to the gross yield of wood per acre. Height confers the small advantage in a Casuarina plantation of a lessened diameter for equal bulks of wood, and consequently a greater facility for sawing up into firewood billets.

In tabulating and comparing the figures obtained from the Nílgiri Blue-gums a most unexpected result became apparent, viz., that, comparing the dense (6 × 6) and the sparse (9 × 9) planting in the Eucalyptus plantations, not only was the Acre-increment better in the sparse planting and the Individual-increment incomparably so, but the *average height of the trees in the sparse planting proved greater than the average heights in the dense planting.* Whichever planting might yield the best growth in bulk of wood, it was naturally expected that the denser planting would have the taller trees, but the reverse proved to be the case. Casuarina, the fast-growing fuel tree of the plains, and elevations up to 5,000 feet, behaves exactly like the Blue-gum, the fast-growing fuel tree of the hill above 5,000 feet. Casuarina is an exceedingly fast grower; the Blue-gum on the Nílgiris, incredible as it may seem, makes wood at about double the rate of Casuarina. But their wonderful rates of growth are only realized on the condition that both trees have ample light and space—a requirement which is more marked in the case of the Casuarina than of the Blue-gum. Planted in very light shade, both Casuarina and Blue-gum cease to grow ; planted dense in close plantations, the trees lose not only in girth, but also in height, this loss of height being more marked in the Casuarina than in the Blue-gum. Glancing down the column of average heights for the Nellore Casuarinas, it will be perceived at once how height is lost as density of planting increases. In the *Tumalapenta* plantation are two Sample-areas, C and D, on the same soil, side by side, touching one another. Each area is nine years old, and has received exactly the same treatment. The average height of the trees in C is now 44·86 feet, of those in D 32·98 ; C has 374 trees to the acre and D had 1,658 trees up to six months ago. In Kottapatam C, which is only a year older, and where the trees are

nearly isolated, the average height is 59·96 feet. Again, Tumalapenta A, which is five-and-a-half years old, may be compared to Tumalapenta F, which is five years old, the average heights being 43·74 and 27·22, respectively, A being sparse and F dense planting. In Taminapatnam plantation the growth is better than in the Tumalapenta plantation, but this is far from bringing the heights of Tumalapenta A and Taminapatnam A to even an equality ; in Tumalapenta A, planted 285 trees to the acre, the average height is 43·74 ; in Taminapatnam A, planted 1,944 trees to the acre, the average height is 31·30. In Tumalapenta B, with 383 trees to the acre, the average height of the trees is about equal to Dugarázpatnam A, the latter being a small piece of private planting on manured wet land, while Tumalapenta is the plantation of the poorest growth of any measured. Kottapatam A, the shore close planting, has an average height of 38·99 feet at eight years of age. The comparatively poor Tumalapenta plantation at nine years of age has nevertheless in the sparse planting an average height of 44·86 feet.

Average Dimensions of the Trees in the Plantations measured.

Plantations.	Age in Years.	Girth at 5 Feet in Inches.	Height of Tree in Feet.	Cubic Contents in Cubic Feet.		Remarks.
Tumalapenta A	5·5	18·69	43·74	5·16	Sparse planting.	Here A and C are of nearly equal average dimensions, although C is nearly double the age of A, the reason being chiefly that A is planted 285 trees per acre, while C is 374 trees per acre.
Do. B	3·5	10·15	29·86	1·24		
Do. C	9·	17·58	44·86	4·514		
Tumalapenta D	9·	8·27	32·98	0 75	Dense planting.	Planted 4½ × 4½
Do. E	7·	7·49	28·78	0 60		Do. 4½ × 4½
Do. F	5·	7·46	27·22	0 54		Do. 6 × 6
Taminapatnam A	5·	6·63	31·30	0·58		Do. 4½ × 4½
Do B	7·	7·90	35·24	0·91		Do. 4½ × 4½
Kottapatam A	8·	8·97	38·99	1·49		Do. 4½ × 4½
Do. B	7·	8·16	35·68	1 09		Do. 4½ × 4½
Dugarázpatnam A	3·	7·66	28·50	0·62		Do. 4½ × 4½
Kottapatam C	10·	28 48	59 96	15·56	Isolated trees.	Planted in scattered groups.
Kistnapatam	17·	44·70	66·20	40·31		In a plantation with scattered trees.
Dugarázpatnam B	20·	38·01	48·74	23·68		In a row by the Buckingham Canal.
Sríharikót	20·	56·90	77·85	71·95		Do. do.

Specific Gravity of Coast Casuarina.

29. In continuation of the concluding remarks of my note on the growth of Casuarina in Mysore, it will be observed from the table of experimental weighings of Coast Casuarina that the latter is slightly lighter than Mysore wood. In Mysore the weight of green branch-wood with bark was determined to be 72 lb. per cubic foot ; of seasoned branch wood with bark to be 52 lb. per cubic foot; for branch and trunk-wood together 54 to 56 lb. per cubic foot. For Coast Casuarina the mean of 20 pieces measured and weighed at the Tumalapenta plantation is 69·03 lb. per cubic foot for green wood with bark. Probably on an average soil composed less exclusively of pure sand the weight would be slightly heavier ; 70 lb. per cubic foot is the figure adopted in the calculations, after the figures referring to the first plantation in which the Mysore value of 72 lb. per cubic foot was employed. In converting the cubic feet of the Acre-increment into tons of dry wood, the value of 45 cubic feet per ton was used. This equals 49·7 lb. per cubic foot. In the weighings of seasoned branch-wood with bark at Dugarázpatnam 45·04 is the mean value obtained, but this value, it will be observed, refers exclusively to wood of small diameter seasoned as much as three years. Ordinarily, there is no doubt that the value of seasoned Casuarina wood with bark, branch-wood and trunk-wood together, is not below 50 lb. per cubic foot. To recapitulate, the values obtained for the specific gravity of Casuarina wood stands thus :—

Green Branch-wood with Bark.

Mysore Wood per Cubic Foot.	Coast Wood per Cubic Foot.
72 lb.	70 lb.

Green trunk-wood with bark may be slightly heavier, but this figure is not required when the trunks are measured as in the case of "cubage."

One year seasoned Branch-wood and Trunk-wood with Bark.

Mysore Wood.	Coast Wood.
55 lb. (branch-wood alone being 52 lb.)	50 lb. (branch-wood alone being about 48 lb.)

Experimental Weighing of Billets of Casuarina Wood, green and with bark, from Tumalapenta Plantation. Wood grown on loose sand within a hundred yards of the sea.

	Number of Trees.	Mean Girth in Inches.	Length in Feet.	Cubic Content in Feet.	Weight of Billet in Pounds.	Weight per Cubic Foot in Pounds.
	1	8·75	10	0·42	29·0	69·05
	2	6·25	10	0·22	15·5	70·45
	3	7·50	9	0·28	20·5	73·21
	4	9·25	9	0·42	32·0	76·19
	5	8·50	8	0·31	23·0	74·19
	6	6·25	8	0·17	10·5	61·77
	7	12 25	8	0·66	50·0	75·76
	8	10·0	8	0·44	32·0	72·73
	9	6 75	7	0·17	10·5	61·77
	10	7·25	7	0·20	12·5	62·50
	11	6·50	7	0·16	10·5	65·63
	12	6·0	7	0·13	9·5	73·08
	13	9·25	6	0·28	18·0	64·29
	14	8·50	6	0·24	17·0	70·83
	15	8·0	5	0·17	11·5	67·65
	16	7·25	5	0 14	10·5	75·00
	17	7·25	4	0·11	8·0	72·72
	18	8·0	4	0·14	8·5	60·71
	19	10·25	3	0·17	12·0	70·59
	20	9·75	3	0·16	10·0	62·50
Sum ...	...	163·50	134	4·99	351·0	1380·62
Mean ...	...	8·17	6·7	0·25	17·55	69·03

Weighings for Specific Gravity of Coast Casuarina three years seasoned and with Bark.

Number of Piece.	Mean Girth.	Sectional Area in Feet.	Length of Piece.	Cubic Content.	Weight in lb.	Weight per Cubic Foot.	Remarks.
1	6·75	0·0255	14	0·36	16·00	44·44	These pieces of wood were carefully examined previous to being measured and weighed, all which showed signs of being bored by insects or of the slightest decay were rejected. The wood was obtained from an old grass hut pulled down for the purpose at Dugarázpatnam.
2	11·58	0·0744	10	0·74	34·50	46·62	
3	11·50	0·0731	8	0·58	27·00	46·55	
4	11·83	0 0769	8	0·62	30 00	48·39	
5	7·92	0·0345	10	0·35	15·50	44 29	
6	8·75	0·0423	13	0·55	24·00	43·64	
7	7·00	0·0271	15	0·41	18·00	43·90	
8	7·67	0·0323	12	0·39	18·00	46·15	
9	7·08	0·0279	10	0·28	12·50	44·64	
10	6·17	0·0209	12	0 25	11·00	44·00	
11	6·25	0·0216	9	0·19	8·50	44·74	
12	6·33	0·0223	11	0·25	11·50	46·00	
13	6·08	0·0206	10	0·21	9·25	44·05	
14	6·75	0·0252	13	0·33	17·00	51·52	
15	5·17	0·0147	11	0·16	6·50	40·63	
16	7·50	0·0311	7	0·22	9·30	42·27	
17	6·25	0·0216	10	0·22	10 50	47·73	
18	7·17	0·0283	7	0·20	8·25	41·25	
19	5·92	0·0192	11	0·21	9·50	45·24	
20	7·42	0·0303	8	0 24	10 75	44·79	
Sum..	151·09	0·6698	209	6 76	307·55	900·84	
Average..	7·55	0·0335	10·45	0·34	15 38	45·04	

Thickness of Bark.

The following statement shows the average thickness of Casuarina bark, or thickness which is included in all the girths shown in these tables, and which it is

therefore useful to record. The average thickness of Casuarina bark is less than that of Blue-gum bark, and those figures have interest, taking the comparison between them and the similar figures given in the Nílgiri report for the Blue-gum tree and for another Eucalypt, the Stringy-bark tree. As with the Eucalypts, the thickness of bark increases directly with the girth, and consequently indirectly with the age and growth of the trees :—

KOTTAPATAM PLANTATION.

Averages of Thickness of Bark.

Plantations.	Number of Tree.	Age.	Average Girth.	Mean Thickness of Bark on the Trunk at 5 feet from the ground.	Mean Thickness of Bark on the Branch-wood.	Remarks.
			INCHES.			
Kottapatam A	1	Eight years of age.	9	0·094	0·031	Dense planting
	2		15	0·156	0·047	
	3		7	0·062	0·016	
	4		12	0·109	0·047	
	5		10	0·094	0·031	
	6		11	0·094	0 047	
	7		9	0·094	0·031	
	8		12	0·094	0·031	
	9		8	0·078	0·031	
	10		11	0·078	0·047	
Sum ..	..	..	104	0·953	0·359	
Average ..	..	..	10·4	·0953	·0359	
Kottapatam B	1	Seven years of age.	11	0·109	0 047	Dense planting.
	2		9	0·062	0·031	
	3		11	0·079	0·031	
	4		9	0·109	0·031	
	5		8	0·062	0·031	
	6		7	0·062	0·016	
	7		8	0·062	0·016	
	8		11	0·062	0·031	
	9		8	0·079	0·037	
	10		11	0·093	0·047	
Sum ..	..	..	93	0·779	0·318	
Average ..	..	..	9·3	·0779	·0318	
Kottapatam C	1	Ten years of age.	33	0·281	0·125	Sparse planting; these measurements refer to margin trees.
	2		26	0·125	0·062	
	3		25	0·125	0·109	
	4		29	0·187	0·125	
	5		36	0·266	0·125	
	6		21	0·125	0·062	
	7		19	0·094	0·062	
	8		25	0·25	0·078	
	9		20	0·125	0·078	
	10		23	0·187	0·031	
Sum ..	..	..	257	1·765	0·857	
Average ..	..	..	25·7	·1765	·0857	

CONCLUDING SUGGESTIONS.

30. In the light of the figures of growth which have been obtained and the observation made during my tour regarding the culture of Casuarina on the Madras Coast, I have to offer the following suggestions. I would urge that, considering the dearness of fuel in Madras, afforesting the waste lands of the coast should be looked on as a work of public utility; the advantages of this, from an economical point of view, can hardly be over-stated. Coal is brought from England for the railways, and wood fuel for cooking sells in Madras at an average rate of Rs. 10 per ton. Estimates amounting to many lakhs of rupees are before Government for deepening and completing the Buckingham Canal. The Suez Canal

5735

was opened employing manual labor for the earthwork, but the greater portion of the present depth, it is stated, has been attained by steam-dredging. If the price of fuel in Madras were one-half the present rate, it would have to be considered to what extent steam-dredging would reduce the cost of deepening the Buckingham Canal. Steam-dredging in the harbour is an eventuality that has to be kept in view. How the working of the cotton mills and sections of the railways near Madras would be affected by a reduction in the price of fuel to one-half its present price are questions to which there is only one answer. Now 100 miles of coast, supposing the waste land and dunes to be on an average only half a mile broad, afforested with Casuarina would yield not less than 100,000 tons of dry fuel per annum—

Square Miles.		Acres.		Average Acre-increment.	
50	×	640	×	3	= 96,000 tons.

One-half the present price of fuel in Madras, or Rs. 5 per ton, would allow Rs. 4 as the average cost of cutting, sawing up and transport by canal to Madras × Re. 1, a fair seigniorage to Government. It is now recognized that the conservation and improvement by fire protection and culture of the poor scrub forests on the plains and low hills is a public duty. It is a work in which there are many difficulties, and one in which the improvement in the forests and in their yield can only advance slowly in consequence of the poor character of the forest operated upon. The Acre-increment in these forests is variously estimated from 0·1 ton to 0·5 ton; in the majority of the poorer scrub forests it probably does not exceed 0·1 or 0·2 tons, or from $\frac{1}{30}$ to $\frac{1}{15}$ the Acre-increment of Casuarina. The fuel cuttings on the Sríharikót Island have apparently been too irregular to admit of arriving at even an approximate estimate of the Acre-increment. The "Kandam" or blocks are of unequal area, and the current rotation, which it was intended should have been of eight years, will take twelve or fourteen years to complete. The cutting there is done by pollarding a system tending to lower the Acre-increment and impair natural reproduction. The facilities afforded by the unrivalled water carriage of the Buckingham Canal and the healthy climate of the coast are unique and very powerful recommendations in favor of afforesting the dunes and sand wastes of the sea-board. In a purely forest point of view, the Acre-increment realizable would place the project above every other. The cost of the operation would, of course, depend entirely on how it was managed. To neglect such an opportunity would appear comparable to leaving a coal mine unworked within easy reach of a large city where fuel was unusually dear and scarce.

If the proposal of afforesting the dunes and sand wastes of the coast with Casuarina were approved, the one object to be kept steadily in view should be to get the ground covered as rapidly as possible with not less than 150 trees to the acre. Looking at the figures of growth, it is probable that the Individual-increment rises up to about this limit of sparseness of stock; there is no material loss in the Acre-increment, provided the sparseness of planting does not fall below 200 to the acre. In these afforesting operations, therefore, it should be remembered that the number of trees to the acre cannot fall below 150 to the acre without a loss in the yield of wood, and that it is more economical to plant up fresh waste than to put in more than 200 trees to the acre. If waste land were granted free, planters would be willing, as long as the present high rates for fuel lasted, to plant Casuarina on the condition of surrendering the plantation to Government after the first crop had been cut; this crop to be taken within ten years, and by coppicing so as to leave stools 1 foot above the ground. Land so treated would probably require only skilful cutting to convert it into regular High-forest workable on a rotation of about twenty years. Independently of this, planting by departmental agency must be prosecuted as vigorously as possible, for till the sand dunes and wastes are covered with foliage, a splendid natural advantage remains unutilized; the fresh water 5 feet below the surface sinks unutilized into the sea, the powerful light and heat are wasted on a desert of sand. As has been remarked, 200 trees to the acre (say 15 feet × 15 feet) would, in direct planting, be the most economical, but sparser planting should have an early trial, say about 100 trees to the acre, in which each tree would be multiplied by coppicing and by cutting so as to utilize the reproduction from the trailing side branches.

This class of planting would have the advantage of yielding an early revenue before any great decline in the price of firewood took place, which revenue could, of course, be devoted to the enlargement of planting operations. It might be desirable to devote a fixed sum, say for ten years, to the project of afforesting the dunes and sand wastes of the coast, after which the grant might be discontinued, and the work of planting allowed to go forward solely by its own revenue; or the grant might be continued, or increased, according to circumstance.

Reproduction of Casuarina Forest.

31. In the above calculation the seigniorage or profit to Government on each ton of firewood produced is entered at one rupee. Supposing forest thus formed were worked on a rotation of twenty years, there would be a profit of about—

Years.		Acre-increment.		Rs.
20	×	3	=	60 per acre.

Supposing that natural reproduction failed entirely, Rs. 60 would amply suffice to replant the area artificially. Natural reproduction of Casuarina on the dry portions of the Mysore plateau, where are the large Casuarina plantations, fails entirely; on the Madras Coast natural reproduction of Casuarina occurs in three ways—first, from coppice; second, from self-sown seedlings; third, from the rooting of the trailing branches at the base. Casuarina on the coast does not coppice well unless 1 or 2 feet of stump are left above ground, and even then it depends on the moistness of the locality whether a large proportion of the stumps do not fail to shoot. As has been mentioned, in the Sample-areas D and E of *Tumalapenta*, where the trees were cut at the ground level, only 474 stools out of 1,750 threw up shoots; but as has been mentioned elsewhere, when at 1 or 2 feet above the ground the proportion of coppice shoots is much higher, and it appears that stools which have once coppiced successfully do so again with great facility.

Self-sown seedlings are numerous in certain localities, especially near old trees, on loose soil, and when there is abundant subsoil moisture. Most probably self-sown seedlings would play a very large part in the natural reproduction of a sparse forest of Casuarina worked on a rotation of twenty years.

The rooting of the lowest trailing branches of Casuarina was first shown me by Dr. Brandis.* It is an extremely interesting property of the Casuarina, unfortunately entirely absent on the hard loams of the Mysore plateau, but very common on the loose sands all along the coast. In systematic reproductive cuttings of a forest it would probably be an important factor.

Remarks on Planting in the Nellore District.

32. It is too late now to regret the cost of Casuarina planting in the Nellore District; the annual expenditure on Casuarina planting has been from Rs. 20,000 to 30,000, *vide* Colonel Beddome's report, dated 8th May 1880. Under the expensive system of watering followed, the average expenditure for work (exclusive of supervision) on each established tree is four annas. Planting at the extraordinary rate of 2,000 trees per acre, makes the cost of planting reach the almost incredible figure of *Rs. 500 per acre.* The average cost of planting in Government plantations throughout India (except Madras and Bombay) is about Rs. 42 per acre; the cost of Casuarina planting in Mysore (500 trees to the acre) is Rs. 23 per acre. I should mention that the Wood Overseer has shown me letters in which he protested in vain against this very close planting. Colonel Beddome, on being appealed to, advocated planting 6 feet × 6 feet. Two years ago he unfortunately fell ill on his way to visit these plantations. I believe that they have never hitherto been visited by a Forest Officer. Six feet × six feet is a far less disastrous distance to plant at than 4½ feet × 4½ feet; it gives rather more than half the number of trees per acre, and, if early and heavily thinned, would doubtless yield good figures of growth; but with such a light-loving tree as Casuarina, and one

* Note.—I regret to say that this property of the Casuarina, so common in private forests near Madras, was not once noticed by me on a late inspection in any of the Nellore Government Plantations—J.S.G.

which, even when quite isolated, takes a good shape, it is false economy to plant so close. At five years of age the 6 feet × 6 feet planting in F Sample-area of *Tumalapenta* yielded the poor Acre-increment of 2½ tons.

In considering the best distance apart at which to plant, we have to take the two cases—first, where land is limited and the object aimed at is the highest possible Acre-increment (cropping at what is known as the Commercial Maturity period); second, where land is unlimited and the object is to plant the greatest acreage consistent with a good growth. The first is the case of a private individual planting Casuarina purely for profit, the second of Government planting Casuarina for a forest. The figures of Casuarina growth both in Mysore and on the Madras Coast indicate 12 feet × 12 feet as a good distance for planting in the first case and 15 feet × 15 in the second. In Mysore Casuarina was planted 15 feet × 15 feet for many years, which distance I subsequently altered to 9 feet × 9 feet; it was a pleasant surprise, a few months ago, that the 15 feet × 15 feet planting should have yielded so good an Acre-increment as 5·5 tons, *vide* report on growth of Casuarina in the Mysore plantations. The distance of planting in the Mysore plantation was altered from 15 feet × 15 feet to 9 feet × 9 feet, chiefly for cultural reasons, relating to the suppression of scrub and of grass for fire protection. These reasons do not exist on the Madras Coast; and further, the system of planting followed by both private individuals and by Government is much more expensive than the Mysore system of planting, making it so much the more economical to plant spare. It remains to test in practice whether the Mysore system of Casuarina planting, coasting from 1 anna to 1½ annas per established tree, could not be practised on the coast. An account of this system was circulated to all Forest Officers under the Government of India about two years ago and reprinted subsequently in the *Indian Forester*.

TUMALAPENTA PLANTATION.

SAMPLE PLOT A. (Planted about 12′ × 12′, area 0·1211 acres.)

Number of Tree.	Girth at 5 feet.	Height of Tree.	Ideal Cylinder.	Number of Tree.	Girth at 5 feet.	Height of Tree.	Ideal Cylinder.
1	22	41	10·96	57	16	43	6·08
2	16	40	5·65	58	21	46	11·21
3	18	47	8·41	59	14	30	3·24
4	18	44	7·87	60	23	50	14·61
5	17	34	5·43	61	26	51	19·05
6	23	56	16·37	62	18	46	8·23
7	17	44	7·02	63	19	38	7·58
8	24	56	17·82	64	15	35	4·35
9	9	24	1·07	65	26	40	14·94
10	24	50	15·91	66	15	34	4·22
11	20	47	10·38	67	14	23	2·49
12	20	56	12·37	68	15	40	4·97
13	18	47	8·41	69	22	37	9·89
14	18	54	9·66	70	20	51	11·27
15	21	50	12·18	71	24	45	14·32
16	19	52	10·37	72	20	36	7·95
17	14	30	3·24	73	19	45	8·97
18	19	50	9·97	74	25	52	17·96
19	22	40	10·69	75	16	44	6·22
20	18	46	8·23	76	21	51	12·42
21	17	42	6·70	77	24	48	15·27
22	21	37	9·01	78	24	47	14·96
23	22	44	11·76	79	25	56	19·34
24	23	52	15·20	80	24	48	15·27
25	18	45	8·05	81	27	46	18·53
26	17	47	7·50	82	24	47	14·96
27	19	45	8·97	83	16	39	5·51
28	20	48	10·61	84	18	45	8·05
29	21	44	10·72	85	21	51	12·42
30	16	41	5·80	86	21	46	11·21
31	19	40	7·97	87	15	36	4·47
32	23	42	12·27	88	21	30	7·31
33	26	43	16·06	89	15	36	4·47
34	22	43	11·50	90	16	31	4·38
35	12	29	2·30	91	17	36	5·74
36	19	40	7·97	92	19	48	9·57
37	20	47	10·38	93	21	46	11·21
38	14	43	4·65	94	15	45	5·59
39	19	36	7·18	95	17	40	6·38
40	16	42	5·94	96	18	47	8·41
41	15	38	4·72	97	16	46	6·50
42	17	48	7·66	98	14	31	3·35
43	17	44	7·02	99	23	47	13·73
44	20	47	10·38	100	17	42	6·70
45	23	52	15·20	101	20	50	11·05
46	11	41	2·74	102	21	55	13·40
47	13	38	3·54	103	16	46	6·50
48	15	42	5·22	104	23	40	11·69
49	20	54	11·93	105	18	46	8·23
50	17	50	7·98	106	9	34	1·52
51	19	42	8·37	107	20	46	10·16
52	19	49	9·77	108	18	42	7·52
53	20	50	11·05	109	18	47	8·41
54	18	55	9·84	110	21	48	11·69
55	12	46	3·66	111	13	37	3·45
56	15	56	6·96	112	16	39	5·51

TUMALAPENTA PLANTATION—(*Continued*).

Sample Plot A—(*Continued*).

Number of Tree.	Girth at 5 feet.	Height of Tree.	Ideal Cylinder.	Number of Tree.	Girth at 5 feet.	Height of Tree.	Ideal Cylinder.
113	12	25	1·98	119	20	43	9·50
114	19	38	7·58	120	18	38	6·80
115	16	45	6·36	121	24	57	18·14
116	21	51	12·42				
117	14	40	4·33				
118	16	45	6·36	Total ...	2,262	5,293	1094·49
				Average ...	13·69	43·74	9·05
				Maximum ...	27	46	18·53
				Minimum ...	9	24	1·07

Calculation of Results.

The factor to be used, see next table, is 0·57 cubic feet per tree, obtained from the measurements of 10 trees cut in this plot.

The total stock on the sample area is = 1094·49 × 0·57 = 623·86 cubic feet.

The stock per acre therefore is = 623·86 cubic feet ÷ 0·4244 acres = 1469·98 cubic feet.

The total number of trees on the sample plot = 121.

Therefore, the number of trees per acre = 121 ÷ 0·4244 = 285·11 trees.

The average contents of each tree $= \frac{1469 \cdot 98}{285 \cdot 11} = 5 \cdot 15$ cubic feet.

The yearly individual increment is therefore $= \frac{5 \cdot 15}{5 \cdot 5} = 0 \cdot 94$ cubic feet, the plantation being considered to be 5·5 years old.

In order, however, to obtain the most accurate data we must also take into consideration the possible amount which *blanks* in the canopy would give as well as the amount obtained from *thinnings*. Judging by a tree blown down in the cyclone, the number of *blanks* may be estimated at 2 per acre, equivalent to 10·3 cubic feet according to the calculation given above. As regards *thinnings* none have ever been made, the plot having been an experimental plantation.

The amount of material on an acre may therefore be taken as the sum of the *actual stock*, *blanks* and *thinnings*, or 1469·98 + 10·3 = 1480·28 cubic feet, representing a yearly acre-increment of $\frac{1480 \cdot 28}{5 \cdot 5} = 269 \cdot 14$ cubic feet = (at 45 cubic feet per ton) 5·98 tons.

Calculation of Form-factor.

No. of Tree.	Girth at 5 feet above ground.	Height of Tree (Total).	Ideal Cylinder from Girth at 5 feet.	Cubic Content from 10 feet sections of stem	Cubic Content of Top and Branches by Weighing.		True Cubic Content of Tree (5 + 6.)	Reducing-factor (7 ÷ 4).	Remarks.
					Wood.	Twigs.			
1	2	3	4	5	6		7	8	
1	19	47	9·37	3·22	1·31	0·33	4·86	0·52	Tree broken in a cyclone a few years ago.
2	16	48	6·79	2·93	0·86	0·35	4·14	0·61	
3	16	49	6·93	3·16	0·29	0·27	3·72	0·54	
4	16	53	7·49	3·05	0·88	0·26	4·19	0·56	
5	16	50	7·07	2·64	0·69	0·20	3·53	0·50	Stem small; whole tree weighed.
6	18	52	9·31	4·17	1·26	0·60	6·03	0·65	
7	15	40	4·97	1·79	0·58	0·21	2·58	0·52	
8	19	46	9·17	..	5·06	0·29	5·35	0·58	
9	17	49	7·82	3·07	0·88	0·32	4·27	0·55	
10	21	53	12·91	4·98	2·18	1·02	8·18	0·63	
Total ..	173	487	81·83	29·01	13·99	3·85	46·85	5·66	
Mean ..	17·3	48·7	8·18	2·90	1·40	0·38	4·68	0·566	

Form-factor 46·85 ÷ 81·83 = 0·572.

Note.—In the above it is noteworthy that the first value for the Form-factor is the lesser, the reverse being usually the case in a close plantation, where the larger, taller trees have Form-factors below the average. Here Tree No. 10, with an unusually large developed head, has a high Form-factor, and, being in size twice the average, it has tended to slightly raise the second value of the Form-factor above the first.

TUMALAPENTA PLANTATION—(*Continued*).

SAMPLE PLOT B. (Planted about 11′ × 11′, area 0·4802 acres.)

Number of Tree.	Girth at 5 feet.	Height of Tree.	Ideal Cylinder.	Number of Tree.	Girth at 5 feet.	Height of Tree.	Ideal Cylinder.
1	11	30	2·00	60	9	25	1·11
2	10	31	1·71	61	10	40	2·21
3	11	33	2·20	62	7	35	0·94
4	10	29	1·60	63	6	24	0·47
5	12	32	2·54	64	8	29	1·02
6	11	30	2·00	65	9	33	1·47
7	10	31	1·71	66	8	30	1·06
8	11	34	2·27	67	11	34	2·27
9	9	30	1·34	68	10	26	1·43
10	9	30	1·34	69	9	27	1·20
11	10	28	1·54	70	9	27	1·20
12	14	28	3·03	71	10	32	1·76
13	13	34	3·17	72	4	18	0·16
14	10	33	1·82	73	6	20	0·39
15	11	28	1·87	74	7	27	0·73
16	9	30	1·34	75	9	27	1·20
17	15	35	4·35	76	9	28	1·25
18	10	30	1·65	77	11	32	2·13
19	12	30	2·38	78	13	35	3·26
20	10	34	1·87	79	11	35	2·34
21	12	33	2·62	80	8	22	0·77
22	11	34	2·27	81	7	29	0·78
23	9	30	1·34	82	6	20	0·39
24	10	31	1·71	83	5	23	0·32
25	12	32	2·54	84	10	29	1·60
26	11	34	2·27	85	7	29	0·78
27	10	32	1·76	86	8	30	1·06
28	9	32	1·43	87	13	35	3·26
29	11	32	2·13	88	8	28	0·99
30	12	42	3·34	89	9	29	1·29
31	12	30	2·38	90	10	30	1·65
32	11	34	2·27	91	10	29	1·60
33	13	30	2·80	92	14	35	3·79
34	10	32	1·76	93	12	33	2·62
35	14	34	3·68	94	10	31	1·71
36	12	35	2·78	95	8	31	1·09
37	15	28	3·48	96	11	32	2·13
38	12	37	2·94	97	11	32	2·13
39	10	31	1·71	98	12	34	2·70
40	10	30	1·65	99	11	30	2·00
41	10	33	1·82	100	11	33	2·20
42	7	25	0·67	101	11	32	2·13
43	10	28	1·54	102	16	37	5·23
44	10	31	1·71	103	14	37	4·00
45	10	30	1·65	104	10	34	1·87
46	11	34	2·27	105	9	29	1·29
47	10	30	1·65	106	11	33	2·20
48	10	35	1·93	107	12	32	2·54
49	11	40	2·67	108	9	34	1·52
50	10	34	1·87	109	11	31	2·07
51	11	32	2·13	110	9	29	1·29
52	7	25	0·67	111	12	32	2·54
53	6	32	0·63	112	8	28	0·99
54	10	33	1·82	113	10	30	1·65
55	9	20	0·89	114	11	35	2·34
56	8	30	1·06	115	12	37	2·94
57	11	34	2·27	116	8	30	1·06
58	10	30	1·65	117	11	34	2·27
59	10	30	1·65	118	10	31	1·71

TUMALAPENTA PLANTATION—(*Continued*).

Sample Plot B—(*Continued*).

Number of Tree.	Girth at 5 feet.	Height of Tree.	Ideal Cylinder.	Number of Tree.	Girth at 5 feet.	Height of Tree.	Ideal Cylinder.
119	11	32	2·13	156	11	31	2·07
120	12	31	2·46	157	11	31	2·07
121	12	32	2·54	158	9	22	0·98
122	12	33	2·62	159	6	10	0·19
123	12	33	2·62	160	11	22	1·47
124	13	28	2·61	161	11	27	1·80
125	11	34	2·27	162	8	18	0·63
126	13	34	3·17	163	14	28	3·03
127	10	32	1·76	164	9	19	0·85
128	10	27	1·49	165	8	27	0 95
129	12	32	2·54	166	9	22	0 98
130	10	25	1·38	167	7	16	0·43
131	10	32	1·76	168 ...	4	15	0·13
132	11	28	1·87	169 ...	6	20	0·39
133	12	22	1·75	170	6	21	0·41
134	12	31	2·46	171	5	20	0·27
135	14	36	3·89	172	9	22	0·98
136	16	31	4·38	173	10	27	1·49
137	12	33	2·62	174 .. .	9	22	0·98
138	10	31	1·71	175	10	29	1·60
139	8	29	1·02	176	9	25	1·11
140	15	35	4·35	177	10	23	1·27
141	10	30	1·65	178	9	24	1·07
142	11	30	2·00	179	11	33	2·20
143	11	31	2·07	180 .. .	12	36	2·86
144	10	31	1·71	181	10	29	1·60
145	9	32	1·43	182	10	29	1 60
146	10	31	1·71	183	10	30	1·65
147	9	30	1·34	184	5	18	0·25
148	12	32	2·54				
149	8	29	1·02	Total ...	1,867	5,494	337·58
150	12	33	2·62				
151	11	32	2·13	Average ...	10·75	29·86	1·83
152	12	31	2·46				
153	11	32	2·13	Maximum ...	16	37	5·23
154	8	27	0·95				
155	10	34	1·87	Minimum ...	4	15	0 13

TUMALAPENTA PLANTATION—(*Continued*).

PLOT B—(*Continued*).

Calculation of Results.

The factor to be used, see next table, is 0·675 cubic feet per tree, obtained from the measurements of 10 trees cut in this plot.

The total stock on the sample area is = 337·58 × 0·675 = 227·87 cubic feet.

The stock per acre therefore is = 227·87 cubic feet ÷ 0·4802 acres = 474·52 cubic feet.

The total number of trees on the sample plot = 184.

Therefore, the number of trees per acre = 184 ÷ 0·4802 = 383·17 trees.

The average contents of each tree = $\frac{474·52}{383·17}$ = 1·24 cubic feet.

The yearly individual increment is therefore = $\frac{1·24}{3·5}$ = 0·35 cubic feet, the plantation being considered to be 3·5 years old.

In order, however, to obtain the most accurate data we must also take into consideration the possible amount which *blanks* in the canopy would give as well as the amount obtained from *thinnings*. The number of *blanks* may be estimated at 5 per acre, equivalent to 6·19 cubic feet according to the calculation given above. As regards *thinnings* none have been made, the plot having been an experimental plantation.

The amount of material on an acre may therefore be taken as the sum of the *actual stock*, *blanks* and *thinnings*, or 474·52 + 6·19 = 480·71 cubic feet, representing a yearly acre-increment of $\frac{480·71}{3·5}$ = 137·34 cubic feet. = (at 45 cubic feet per ton) 3·05 tons.

Calculation of Form-factor.

No. of Tree.	Girth at 5 feet.	Height of Tree.	Ideal Cylinder from Girth at 5 feet.	Cubic Content from 10 feet sections of stem.	Cubic Content of Top and Branches by Weighing.		True Cubic Content of Tree (5 + 6.)	Form-factor (7 ÷ 4).	Remarks.
					Wood.	Twigs.			
1	2	3	4	5	6		7	8	
1	8	32	1·13	0·54	0·10	0·11	0·75	0·66	
2	9	29	1·29	0·44	0·25	0·13	0·82	0·64	
3	11	38	2·54	1·01	0·56	0·30	1·87	0·74	
4	10	30	1·65	0·69	0·31	0·21	1·21	0·73	
5	12	33	2·62	1·06	0·51	0·31	1·88	0·72	
6	12	34	2·70	..	1·22	0·22	1·44	0·53	Stem small; whole tree weighed.
7	11	36	2·40	1·01	0·31	0·24	1·56	0·65	
8	8	31	1·09	0·49	0·11	0·11	0·71	0·65	
9	9	30	1·34	0·63	0·39	0·20	1·22	0·91	
10	10	31	1·71	0·74	0·15	0·12	1·01	0·59	
Sum ..	100	324	18·47	6·61	3·91	1·95	12·47	6·82	
Mean ..	10·0	32·4	1·85	0·66	0·39	·19	1·25	0·68	

Form-factor 12·47 ÷ 18·47 = 0·675.

TUMALAPENTA PLANTATION—(*Continued*).

SAMPLE PLOT C. (Planted about 11′ × 11′, area 0·1739 acres.)

Number of Tree.	Girth at 5 feet.	Height of Tree.	Ideal Cylinder.	Number of Tree.	Girth at 5 feet.	Height of Tree.	Ideal Cylinder.
1	15	46	5·71	38	12	23	1·83
2	17	37	5·90	39	12	36	2·86
3	22	56	14·97	40	15	30	3·73
4	15	43	5·34	41	23	48	14·03
5	20	53	11·71	42	18	52	9·31
6	19	51	10·17	43	11	45	3·00
7	20	50	11·05	44	14	44	4·76
8	24	50	15·91	45	14	40	4·33
9	19	39	7·78	46	16	48	6·79
10	19	55	10·97	47	24	54	17·18
11	21	56	13·64	48	16	52	7·35
12	23	60	17·54	49	23	53	15·49
13	20	48	10·61	50	16	50	7·07
14	13	39	3·64	51	22	46	12·30
15	14	42	4·54	52	12	36	2·86
16	14	41	4·44	53	14	31	3·35
17	11	40	2·67	54	11	32	2·13
18	31	60	31·86	55	19	43	8·57
19	27	58	23·36	56	14	29	3·14
20	23	45	13·15	57	17	43	6·86
21	20	40	8·84	58	16	45	6·36
22	24	56	17·82	59	18	38	6·80
23	19	53	10·57	60	20	58	12·82
24	16	41	5·80	61	14	47	5·09
25	14	44	4·76	62	19	41	8·17
26	16	53	7·49	63	16	42	5·94
27	12	39	3·10	64	24	52	16·55
28	7	26	0·70	65	20	55	12·15
29	10	29	1·60				
30	19	51	10·17	Total ...	1,143	2,916	565·09
31	17	50	7·98				
32	17	37	5·90				
33	21	53	12·91	Average ...	17·58	44·86	8·69
34	17	45	7·18				
35	21	31	7·55	Maximum ...	31	60	31·86
36	14	38	4·11				
37	22	48	12·83	Minimum ...	7	26	0·70

TUMALAPENTA PLANTATION—(*Continued*).

Plot C—(*Continued*).

Calculation of Results.

The factor to be used, see next table, is 0·53 cubic feet per tree, obtained from the measurements of 10 trees cut in this plot.

The total stock on the sample area is = 565·09 × 0·53 = 299·5 cubic feet.

The stock per acre therefore is = 299·5 cubic feet ÷ 0·1739 acres = 1722·25 cubic feet.

The total number of trees on the sample plot = 65.

Therefore, the number of trees per acre = 65 ÷ 0·1739 = 373·78.

The average contents of each tree = $\frac{1722 \cdot 25}{373 \cdot 78}$ = 4 6077 cubic feet.

The yearly individual increment is therefore = $\frac{4 \cdot 6077}{9}$ = ·512 cubic feet, the plantation being considered to be nine years old.

In order, however, to obtain the most accurate data we must also take into consideration the possible amount which *blanks* in the canopy would give as well as the amount obtained from *thinnings*.

The number of *blanks* may be estimated at four average trees or 23 per acre, equivalent to 105·98 cubic feet according to the calculation given above. As regards *thinnings* none have ever been made, the plot having been an experimental plantation.

The amount of material on an acre may, therefore, be taken as the sum of the *actual stock*, *blanks* and *thinnings*, or 1722·25+105·98 = 1828·23 cubic feet, representing a yearly acre-increment of $\frac{1828 \cdot 23}{9}$ = 203·14 cubic feet;

= (at 45 cubic feet per ton) 4·514 tons.

Calculation of Form-factor.

Number of Tree.	Girth at 5 feet.	Height of Tree (Total).	Ideal Cylinder from Girth at 5 feet and Total Height.	Cubic Content from 10 feet sections of stem.	Cubic Content of Top and Branches by Weighing.		True Cubic Content of Tree (5 + 6).	Form Factor (7 ÷ 4).
					Wood.	Twigs.		
1	2	3	4	5	6		7	8
1 ...	23	55	16·07	7·71	1·29	0·34	9·34	0·58
2 ...	17	50	7·98	3·60	0·74	0·37	4·71	0·59
3 ...	16	44	6·22	2·42	0·54	0·26	3·22	0·52
4 ...	16	41	5·80	1·82	0·10	0·06	1·98	0·34
5 ...	14	44	4·76	2·09	0·47	0·15	2·71	0·57
6 ...	14	52	5·63	2·18	0·39	0·14	2·71	0·48
7 ...	16	46	6·50	2·64	0·57	0·27	3·48	0 54
8 ...	21	51	12·42	4·22	1·47	0·50	6·19	0·50
9 ...	12	37	2·94	1·23	0 39	0·12	1·74	0·59
10 ...	13	40	3·73	1·56	0·36	0·16	2·08	0·56
Total ...	162	460	72·05	29·47	6·32	2·37	38·16	5·27
Mean ...	16·2	46·0	7·21	2·95	0·63	0·24	3·82	0·53

Form-factor 38·16 ÷ 72·05 = 0·530.

TUMALAPENTA PLANTATION—(*Continued*).

Sample Plot D.

Number of Tree.	Girth at 5 Feet.	Height of Tree.	Ideal Cylinder.	Number of Tree.	Girth at 5 Feet.	Height of Tree.	Ideal Cylinder.
1	10	34	1·87	60	12	42	3·84
2	6	18	0·35	61	11	40	2·67
3	7	20	0·54	62	5	25	0·35
4	5	20	0·27	63	5	21	0·29
5	5	20	0·27	64	6	25	0·49
6	8	36	1·27	65	5	37	0·51
7	9	33	1·47	66	13	43	4·01
8	13	38	3·54	67	9	34	1·52
9	9	33	1·47	68	8	34	1·20
10	10	38	2·09	69	9	34	1·52
11	7	34	0·92	70	8	36	1·27
12	9	34	1·52	71	11	40	2·67
13	9	35	1·56	72	6	25	0·49
14	6	17	0·33	73	11	44	2·94
15	11	35	2·34	74	8	38	1·34
16	8	25	0·88	75	9	34	1·52
17	6	23	0·45	76	5	28	0·39
18	7	25	0·67	77	7	32	0·86
19	8	36	1·27	78	7	26	0·70
20	14	42	4·54	79	12	36	2·86
21	6	25	0·49	80	10	39	2·15
22	11	40	2·67	81	9	35	1·56
23	11	40	2·67	82	8	40	1·41
24	10	40	2·21	83	6	34	0·67
25	9	35	1·56	84	4	22	0·19
26	10	40	2·21	85	6	24	0·47
27	8	30	1·06	86	10	42	2·32
28	9	34	1·52	87	11	40	2·67
29	7	29	0·78	88	7	35	0·94
30	5	24	0·34	89	9	34	1·52
31	5	20	0 27	90	6	38	0·75
32	6	29	0·57	91	7	34	0·92
33	10	40	2·21	92	9	35	1·56
34	7	33	0·89	93	8	35	1·23
35	7	32	0·86	94	10	40	2·21
36	9	34	1·52	95	7	29	0·78
37	6	26	0·51	96	10	36	1·98
38	11	43	2·87	97	9	34	1·52
39	11	43	2·87	98	7	32	0·86
40	8	34	1·20	99	7	30	0·81
41	8	34	1·20	100	4	24	0·21
42	7	26	0·70	101	6	24	0·47
43	7	32	0·86	102	5	23	0·32
44	10	42	2·32	103	10	46	2·54
45	9	30	1·34	104	8	35	1·23
46	12	44	3·50	105	7	32	0·86
47	10	42	2·32	106	11	39	2·60
48	10	35	1·93	107	9	35	1·56
49	9	38	1·70	108	10	39	2·15
50	9	36	1·61	109	7	30	0·81
51	7	26	0·70	110	11	39	2·60
52	8	34	1·20	111	6	26	0·51
53	6	24	0·47	112	10	36	1·98
54	8	34	1·20	113	8	31	1·09
55	9	36	1·61	114	6	31	0·61
56	9	36	1·61	115	10	40	2·21
57	10	39	2·15	116	8	35	1·23
58	7	34	0·92	117	10	39	2·15
59	12	41	3·26	118	5	23	0·32

TUMALAPENTA PLANTATION—(*Continued*).

Sample Plot D—(*Continued*).

Number of Tree.	Girth at 5 feet.	Height of Tree.	Ideal Cylinder.	Number of Tree.	Girth at 5 feet.	Height of Tree.	Ideal Cylinder.
119	7	34	0·92	179	8	34	1·20
120	9	35	1·56	180	11	41	2·74
121	12	40	3·18	181	7	31	0·83
122	8	34	1·20	182	8	33	1·16
123	8	34	1·20	183	10	40	2·21
124	9	35	1·56	184	11	38	2·54
125	6	26	0·51	185	7	30	0·81
126	10	38	2·09	186	4	20	0·18
127	10	32	1·76	187	9	38	1·70
128	7	32	0·86	188	7	34	0·92
129	10	35	1·93	189	9	40	1·79
130	12	43	3·42	190	9	33	1·47
131	11	40	2·67	191	7	34	0·92
132	9	34	1·52	192	10	38	2·09
133	7	30	0·81	193	8	32	1·13
134	10	38	2·09	194	6	25	0·49
135	8	35	1·23	195	12	40	3·18
136	5	20	0·27	196	6	30	0·59
137	8	30	1·06	197	12	40	3·18
138	12	41	3·26	198	11	38	2·54
139	13	44	4·10	199	7	30	0·81
140	8	34	1·20	200	6	38	0·75
141	8	34	1·20	201	5	20	0·27
142	13	41	3·82	202	9	38	1·70
143	11	42	2·80	203	10	41	2·26
144	8	32	1·13	204	10	40	2·21
145	8	31	1·09	205	7	30	0·81
146	9	35	1·56	206	11	38	2·54
147	7	33	0·89	207	9	35	1·56
148	11	41	2·74	208	7	30	0·81
149	7	43	1·16	209	6	26	0·51
150	10	43	2·37	210	10	36	1·98
151	7	34	0·92	211	10	40	2·21
152	9	43	1·92	212	5	20	0·27
153	3	15	0·07	213	7	34	0·92
154	5	20	0·27	214	10	40	2·21
155	4	16	0·14	215	6	33	0·65
156	7	32	0·86	216	6	24	0·47
157	6	27	0·53	217	9	31	1·38
158	10	40	2·21	218	4	15	0·13
159	12	40	3·18	219	16	48	6·79
160	10	39	2·15	220	9	34	1·52
161	7	34	0·92	221	16	35	4·95
162	12	42	3·34	222	5	23	0·32
163	9	44	1·96	223	12	40	3·18
164	9	46	2·05	224	10	38	2·09
165	8	38	1·34	225	10	40	2·21
166	13	46	4·29	226	12	40	3·18
167	9	36	1·61	227	9	40	1·79
168	8	35	1·23	228	7	30	0·81
169	8	36	1·27	229	11	38	2·54
170	10	40	2·21	230	11	36	2·40
171	5	20	0·27	231	9	34	1·52
172	10	34	1·87	232	7	28	0·75
173	7	32	0·86	233	10	36	1·98
174	8	34	1·20	234	6	28	0·55
175	10	38	2·09	235	8	35	1·23
176	13	40	3·73	236	6	30	0·59
177	8	34	1·20	237	10	40	2·21
178	10	42	2·32	238	11	36	2·40

TUMALAPENTA PLANTATION—(*Continued*).

Sample Plot D—(*Continued*).

Number of Tree.	Girth at 5 feet.	Height of Tree.	Ideal Cylinder.	Number of Tree.	Girth at 5 feet.	Height of Tree.	Ideal Cylinder.
239	13	41	3·82	299	6	24	0·47
240	11	43	2·87	300	7	34	0·92
241	12	40	3·18	301	6	34	0·67
242	9	34	1·52	302	11	34	2·27
243	10	40	2·21	303	11	46	3·07
244	4	20	0·18	304	9	36	1·61
245	8	35	1·23	305	8	34	1·20
246	6	30	0·59	306	10	32	1·76
247	6	31	0·61	307	9	38	1·70
248	9	34	1·52	308	8	30	1·06
249	12	43	3·42	309	10	35	1·93
250	10	40	2·21	310	14	43	4·65
251	7	30	0·81	311	10	38	2·09
252	9	32	1·43	312	7	30	0·81
253	10	40	2·21	313	13	43	4·01
254	6	24	0·47	314	10	36	1·98
255	5	15	0·21	315	5	26	0·36
256	10	40	2·21	316	5	23	0·32
257	11	38	2·54	317	9	38	1·70
258	9	32	1·43	318	7	31	0·83
259	12	40	3·18	319	13	41	3·82
260	11	41	2·74	320	8	34	1·20
261	9	40	1·79	321	8	35	1·23
262	6	13	0·25	322	11	39	2·60
263	6	24	0·47	323	6	31	0·61
264	10	40	2·21	324	9	32	1·43
265	6	20	0·39	325	7	29	0·78
266	7	24	0·64	326	5	20	0·27
267	11	42	2·80	327	6	36	0·71
268	5	25	0·35	328	6	37	0·73
269	6	25	0·49	329	6	26	0·51
270	11	42	2·80	330	7	30	0·81
271	7	27	0·73	331	7	30	0·81
272	11	44	2·94	332	9	39	1·74
273	7	30	0·81	333	10	34	1·87
274	12	38	3·02	334	7	30	0·81
275	8	34	1·20	335	10	38	2·09
276	5	25	0·35	336	6	36	0·71
277	4	16	0·14	337	8	32	1·13
278	11	41	2·74	338	10	35	1·93
279	6	30	0·59	339	6	27	0·53
280	5	24	0·34	340	6	23	0·45
281	7	32	0·86	341	11	42	2·80
282	6	25	0·49	342	9	34	1·52
283	8	38	1·34	343	11	40	2·67
284	12	39	3·10	344	7	29	0·78
285	5	31	0·43	345	7	30	0·81
286	6	30	0·59	346	5	22	0·30
287	8	30	1·06	347	11	40	2·67
288	12	40	3·18	348	7	33	0·89
289	11	46	3·07	349	10	34	1·87
290	7	31	0·83	350	8	38	1·34
291	8	32	1·13	351	11	42	2·80
292	10	38	2·09	352	11	39	2·60
293	11	39	2·60	353	11	39	2·60
294	9	32	1·43	354	9	34	1·52
295	7	34	0·92	355	12	42	2·80
296	5	32	0·44	356	12	43	2·87
297	13	44	4·10	357	10	38	2·09
298	8	30	1·06	358	6	26	0·51

TUMALAPENTA PLANTATION—(*Continued*).

Sample Plot D—(*Continued*).

Number of Tree.	Girth at 5 feet.	Height of Tree.	Ideal Cylinder.	Number of Tree.	Girth at 5 feet.	Height of Tree.	Ideal Cylinder.
359	4	16	0·14	419	9	40	1·79
360	10	39	2·15	420	9	40	1·79
361	12	41	3·26	421	4	22	0·19
362	11	47	3·14	422	5	20	0·27
363	8	34	1·20	423	9	37	1·65
364	8	34	1·20	424	9	33	1·47
365	10	38	2·09	425	7	32	0·86
366	7	32	0·86	426	7	31	0·83
367	8	34	1·20	427	7	34	0·92
368	10	45	2·48	428	8	32	1·13
369	10	44	2·43	429	8	31	1·09
370	11	40	2·67	430	8	32	1·13
371	7	37	1·00	431	8	33	1·16
372	4	19	0·17	432	10	40	2·21
373	9	34	1·52	433	8	31	1·09
374	5	35	0·48	434	3	24	0·12
375	7	31	0·83	435	8	35	1·23
376	10	34	1·87	436	8	30	1·06
377	10	35	1·93	437	7	32	0·86
378	5	22	0·30	438	9	33	1·47
379	13	42	3·92	439	7	30	0·81
380	8	33	1·16	440	7	30	0·81
381	9	33	1·47	441	5	21	0·29
382	5	21	0·29	442	12	35	2·78
383	7	31	0·83	443	8	32	1·13
384	7	31	0·83	444	7	26	0·70
385	6	23	0·45	445	9	32	1·43
386	5	22	0·30	446	8	33	1·16
387	6	31	0·61	447	9	31	1·38
388	9	34	1·52	448	8	31	1·09
389	9	33	1·47	449	11	40	2·67
390	6	30	0·59	450	8	35	1·23
391	7	32	0·86	451	9	36	1·61
392	8	31	1·09	452	8	35	1·23
393	11	36	2·40	453	9	34	1·52
394	9	31	1·38	454	8	32	1·13
395	10	36	1·98	455	11	41	2·74
396	9	35	1·56	456	8	33	1·16
397	8	33	1·16	457	8	31	1·09
398	11	37	2·47	458	4	21	0·18
399	8	35	1·23	459	6	28	0·55
400	7	34	0·92	460	9	34	1·52
401	8	33	1·16	461	9	37	1·65
402	7	32	0·86	462	8	32	1·13
403	8	27	0·95	463	10	38	2·09
404	7	30	0·81	464	9	35	1·56
405	7	25	0·67	465	4	20	0·18
406	9	32	1·43	466	11	40	2·67
407	7	26	0·70	467	11	43	2·87
408	10	35	1·93	468	3	21	0·10
409	9	36	1·61	469	8	36	1·27
410	5	21	0·29	470	6	28	0·55
411	4	28	0·25	471	5	22	0·30
412	8	36	1·27	472	9	30	1·34
413	10	37	2·04	473	4	20	0·18
414	9	31	1·38	474	7	30	0·81
415	7	30	0·81	475	11	39	2·60
416	8	33	1·16	476	8	33	1·16
417	5	22	0·30	477	4	21	0·18
418	6	29	0·57	478	10	36	1·98

TUMALAPENTA PLANTATION—(*Continued*).

Sample Plot D—(*Continued*).

Number of Tree.	Girth at 5 feet.	Height of Tree.	Ideal Cylinder.	Number of Tree.	Girth at 5 feet.	Height of Tree.	Ideal Cylinder.
479	8	34	1·20	538	9	35	1·56
480	5	28	0·39	539	5	25	0·35
481	3	15	0·07	540	13	38	3·54
482	5	30	0·41	541	7	31	0·83
483	10	40	2·21	542	8	30	1·06
484	11	43	2·87	543	7	33	0·89
485	9	33	1·47	544	7	31	0·83
486	9	37	1·65	545	8	32	1·13
487	7	32	0·86	546	8	32	1·13
488	6	26	0·51	547	9	34	1·52
489	10	36	1·98	548	12	43	3·42
490	8	32	1·13	549	5	25	0·35
491	7	31	0·83	550	5	24	0·34
492	9	36	1·61	551	6	23	0.45
493	7	30	0·81	552	6	21	0·41
494	6	29	0·57	553	8	33	1·16
495	4	18	0·16	554	4	22	0·19
496	12	40	3·18	555	12	41	3·26
497	12	37	2·94	556	10	36	1·98
498	4	25	0·22	557	10	33	1·82
499	5	23	0·32	558	8	32	1·13
500	9	32	1·43	559	7	32	0·86
501	7	34	0·92	560	9	35	1·56
502	10	37	2·04	561	7	31	0·83
503	9	36	1·61	562	7	32	0·86
504	7	29	0·78	563	9	33	1·47
505	7	31	0·83	564	10	35	1·93
506	9	35	1·56	565	10	34	1·87
507	5	19	0·26	566	6	31	0·61
508	8	32	1·13	567	6	26	0·51
509	5	21	0·29	568	7	31	0·83
510	8	32	1·13	569	8	33	1·16
511	10	42	2·32	570	12	43	3·42
512	9	34	1·52	571	6	29	0·57
513	9	34	1·52	572	5	22	0·30
514	7	21	0·56	573	9	33	1·47
515	4	19	0·17	574	7	32	0·86
516	8	30	1·06	575	7	30	0·81
517	10	40	2·21	576	5	22	0·30
518	6	26	0·51	577	9	35	1·56
519	8	32	1·13	578	8	35	1·23
520	6	26	0·51	579	6	28	0·55
521	8	36	1·27	580	9	29	1·29
522	5	22	0·30	581	8	34	1·20
523	10	36	1·98	582	9	35	1·56
524	5	29	0·40	583	10	38	2·09
525	10	36	1·98	584	7	27	0·73
526	10	35	1·93	585	11	33	2·20
527	7	31	0·83	586	10	34	1·87
528	12	40	3·18	587	7	30	0·81
529	6	25	0·49	588	7	33	0·89
530	13	43	4·01	589	8	34	1·20
531	6	30	0·59	590	6	30	0·59
532	9	33	1·47	591	9	32	1·43
533	10	36	1·98	592	6	25	0·49
534	6	29	0·57	593	8	32	1·13
535	7	26	0·70	594	6	25	0·49
536	12	45	3·58	595	7	31	0·83
537	6	32	0·63	596	11	40	2·67

TUMALAPENTA PLANTATION—(*Continued*).

Sample Plot D—(*Continued*).

Number of Tree.	Girth at 5 feet.	Height of Tree.	Ideal Cylinder.	Number of Tree.	Girth at 5 feet	Height of Tree.	Ideal Cylinder.
597	7	31	0·83	656	6	32	0·63
598	6	25	0·49	657	12	38	3·02
599	10	35	1·93	658	9	34	1·52
600	10	34	1·87	659	15	45	5·59
601	8	34	1·20	660	11	36	2·40
602	7	31	0·83	661	8	33	1·16
603	8	33	1·16	662	6	30	0·59
604	10	41	2·26	663	9	36	1·61
605	7	30	0·81	664	8	34	1·20
606	9	38	1·70	665	5	25	0·35
607	5	21	0·29	666	7	28	0·75
608	9	32	1·43	667	10	34	1·87
609	5	26	0·36	668	10	32	1·76
610	7	28	0·75	669	9	35	1·56
611	8	33	1·16	670	7	25	0·67
612	7	31	0·83	671	12	35	2·78
613	9	34	1·52	672	6	30	0·59
614	7	31	0·83	673	9	33	1·47
615	10	35	1·93	674	7	30	0·81
616	6	25	0·49	675	6	25	0·49
617	9	35	1·56	676	8	31	1·09
618	8	29	1·02	677	11	33	2·20
619	5	25	0·35	678	5	27	0·37
620	9	32	1·43	679	8	32	1·13
621	13	43	4·01	680	6	28	0·55
622	8	32	1·13	681	5	27	0·37
623	12	40	3·18	682	9	34	1·52
624	10	39	2·15	683	6	32	0·63
625	8	31	1·09	684	12	40	3·18
626	9	34	1·52	685	10	36	1·98
627	9	34	1·52	686	7	30	0·81
628	9	35	1·56	687	12	40	3·18
629	10	34	1·87	688	13	42	3·92
630	5	25	0·35	689	10	36	1·98
631	8	32	1·13	690	10	29	1·60
632	6	25	0·49	691	9	35	1·56
633	7	28	0·75	692	7	29	0·78
634	7	31	0·83	693	14	40	4·33
635	6	25	0·49	694	6	25	0·49
636	8	32	1·13	695	10	38	2·09
637	7	31	0·83	696	5	23	0·32
638	10	32	1·76	697	6	27	0·53
639	10	36	1·98	698	6	26	0·51
640	5	27	0·37	699	11	35	2·34
641	7	25	0·67	700	10	36	1·98
642	7	31	0·83	701	8	32	1·13
643	10	41	2·26	702	7	31	0·83
644	6	22	0·43	703	7	34	0·92
645	8	31	1·09	704	5	22	0·30
646	13	42	3·92	705	6	28	0·55
647	11	36	2·40	706	6	31	0·61
648	9	36	1·61	707	8	31	1·09
649	7	28	0·75	708	8	34	1·20
650	8	29	1·02	709	9	36	1·61
651	11	37	2·47	710	11	41	2·74
652	11	34	2·27	711	11	36	2·40
653	11	35	2·34	712	11	38	2·54
654	7	31	0·83	713	8	35	1·23
655	9	35	1·56	714	9	33	1·47

TUMALAPENTA PLANTATION—(*Continued*).

Sample Plot D—(*Continued*).

Number of Tree.	Girth at 5 feet.	Height of Tree.	Ideal Cylinder.	Number of Tree.	Girth at 5 feet.	Height of Tree.	Ideal Cylinder.
715	6	29	0·57	774	7	30	0·81
716	4	20	0·18	775	9	37	1·65
717	12	44	3·50	776	8	35	1·23
718	6	29	0·57	777	9	35	1·56
719	10	41	2·26	778	9	34	1·52
720	4	18	0·16	779	8	35	1·23
721	4	22	0·19	780	7	31	0·83
722	9	31	1·38	781	8	37	1·30
723	11	39	2·60	782	12	45	3·58
724	8	32	1·13	783	13	48	4·48
725	6	29	0·57	784	7	26	0·70
726	12	39	3·10	785	11	36	2·40
727	6	27	0·53	786	5	19	0·26
728	10	37	2·04	787	7	33	0·89
729	6	27	0·53	788	8	34	1·20
730	7	29	0·78	789	6	28	0·55
731	12	40	3·18	790	7	32	0·86
732	5	27	0·37	791	8	35	1·23
733	10	42	2·32	792	8	34	1·20
734	14	44	4·76	793	6	29	0·57
735	11	40	2·67	794	5	27	0·37
736	12	45	3·58	795	8	32	1·13
737	6	20	0·39	796	7	31	0·83
738	11	40	2·67	797	7	33	0·89
739	11	38	2·54	798	5	27	0·37
740	5	20	0·27	799	7	30	0·81
741	7	30	0·81	800	8	32	1·13
742	6	29	0·57	801	8	35	1·23
743	10	35	1·93	802	7	33	0·89
744	9	34	1·52	803	9	35	1·56
745	12	38	3·02	804	10	45	2·48
746	8	36	1·27	805	7	32	0·86
747	12	40	3·18	806	8	25	0·88
748	14	43	4·65	807	6	29	0·57
749	5	26	0·36	808	9	35	1·56
750	10	38	2·09	809	7	28	0·75
751	10	35	1·93	810	9	42	1·88
752	8	33	1·16	811	9	36	1·61
753	11	37	2·47	812	10	47	2·59
754	8	33	1·16	813	9	37	1·65
755	11	41	2·74	814	12	42	3·34
756	8	35	1·23	815	8	36	1·27
757	11	38	2·54	816	5	28	0·39
758	6	26	0·51	817	7	31	0·83
759	9	36	1·61	818	8	35	1·23
760	7	30	0·81	819	5	20	0·27
761	10	38	2·09	820	5	22	0·30
762	13	43	4·01	821	7	32	0·86
763	5	23	0·32	822	6	28	0·55
764	6	27	0·53	823	6	25	0·49
765	6	25	0·49	824	12	45	3·58
766	9	35	1·56	825	11	39	2·60
767	8	35	1·23	826	9	46	2·05
768	8	37	1·30	827	10	46	2·54
769	5	21	0·29	828	9	37	1·65
770	6	27	0·53	829	7	35	0·94
771	10	36	1·98	830	7	35	0·94
772	10	38	2·09	831	9	36	1·61
773	11	42	2·80	832	10	40	2·21

TUMALAPENTA PLANTATION—(*Continued*).

Sample Plot D—(*Continued*).

Number of Tree.	Girth at 5 feet.	Height of Tree.	Ideal Cylinder.	Number of Tree.	Girth at 5 feet.	Height of Tree.	Ideal Cylinder.
833	9	38	1·70	845	9	31	1·38
834	7	28	0·75	846	7	32	0·86
835	8	31	1·09	847	9	33	1·47
836	9	30	1·34	848	8	32	1·13
837	11	41	2·74				
838	7	30	0·81	Total ...	7,015	27,964	1224·82
839	8	34	1·20				
840	9	35	1·56	Average ...	8·27	32·98	1·44
841	11	40	2·67				
842	4	20	0·18	Maximum ...	16	48	5·59
843	5	29	0·40				
844	8	31	1·09	Minimum ...	3	13	0·07

Calculation of Results.

The factor to be used, see next table, is 0·5231 cubic feet per tree, obtained from the measurements of 50 trees cut in this plot.

The total stock on the sample area is = 1224·82 × 0·5231 = 640·7 cubic feet.

The stock per acre, therefore, is = 640·7 cubic feet ÷ 1 acre = 640·7 cubic feet.

The total number of trees on the sample plot = 848.

Therefore the number of trees per acre = 848 ÷ 1 = 848 trees.

The average contents of each tree = $\frac{640 \cdot 7}{848}$ = 0·75 cubic feet.

The yearly individual increment is therefore = $\frac{0 \cdot 75}{9}$ = ·084 cubic feet, the plantation being considered to be nine years old.

In order, however, to obtain the most accurate data, we must also take into consideration the possible amount which *blanks* in the canopy would give as well as the amount obtained from *thinnings*.

Six months ago half the total stock was thinned out quincunx, every alternate tree being felled. The value of this *thinning* is, therefore, 848 × 8·5 × ·084 = 605·47 cubic feet. In the planting there were 103 *blanks* and 126 replaced failures now dominated trees and not taken into account.

The amount of material on an acre may, therefore, be taken as the sum of the *actual stock*, *blanks* and *thinnings*, or 640·70 + 0 + 605·47 = 1246·17 cubic feet, representing a yearly acre-increment of $\frac{1246 \cdot 17}{9}$ = 138·46 cubic feet;

= (at 45 cubic feet per ton) 3·075 tons.

TUMALAPENTA PLANTATION—(*Continued*).

Plot D.

Calculation of Form-factor.

Number of Tree.	Girth at 5 feet.	Height of Tree.	Ideal Cylinder from Girth at 5 feet.	Cubic Content of Tree by Weighing.		True Cubic Content of Tree (5 + 6).	Reducing factor (7 ÷ 5).
				Wood 72 lb. per Cubic Foot.	Twigs and Foliage 200 lb. per Cubic Foot.		
1	2	3	4	5	6	7	8
1	5	22	0·30	0·13	0·02	0·15	0·50
2	9	37	1·65	0·74	0·03	0·77	0·47
3	9	40	1·79	0·82	0·04	0·86	0·48
4	7	27	0·73	0·28	0·03	0·31	0·42
5	8	39	1·37	0·72	0·04	0·76	0·55
6	4	20	0·18	0·08	0·01	0·09	0·50
7	6	33	0·65	0·32	0·01	0·33	0·51
8	7	37	1·00	0·43	0·03	0·46	0·46
9	9	41	1·83	0·89	0·04	0·93	0·51
10	7	36	0·97	0·57	0·03	0·60	0·62
11	11	46	3·07	1·71	0·07	1·78	0·58
12	5	24	0·34	0·18	0·01	0·19	0·56
13	10	41	2·26	1·07	0·06	1·13	0·50
14	11	42	2·80	1·31	0·11	1·42	0·51
15	8	38	1·34	0·61	0·03	0·64	0·48
16	9	37	1·65	0·72	0·04	0·76	0·46
17	9	38	1·70	0·78	0·06	0·84	0·49
18	9	40	1·79	0·96	0·08	1·04	0·58
19	7	28	0·75	0·39	0·03	0·42	0·56
20	12	44	3·50	1·51	0·08	1·59	0·45
21	10	39	2·15	1·14	0·14	1·28	0·60
22	6	23	0·45	0·17	0·02	0·19	0·42
23	11	46	3·07	1·22	0·05	1·27	0·41
24	4	19	0·17	0·08	0·01	0·09	0·53
25	7	32	0·86	0·26	0·03	0·29	0·34
26	8	32	1·13	0·57	0·04	0·61	0·54
27	9	35	1·56	0·57	0·05	0·62	0·40
28	9	33	1·47	0·61	0·05	0·66	0·45
29	6	26	0·51	0·21	0·03	0·24	0·47
30	6	28	0·55	0·22	0·03	0·25	0·45
31	9	34	1·52	0·63	0·04	0·67	0·44
32	11	40	2·67	1·42	0·14	1·56	0·58
33	10	38	2·09	0·97	0·07	1·04	0·50
34	10	38	2·09	0·90	0·07	0·97	0·46
35	9	34	1·52	0·74	0·10	0·84	0·55
36	8	38	1·34	0·75	0·06	0·81	0·60
37	10	38	2·09	1·25	0·13	1·38	0·66
38	9	37	1·65	0·88	0·10	0·98	0·59
39	7	27	0·73	0·31	0·06	0·37	0·51
40	9	37	1·65	0·74	0·08	0·82	0·50
41	10	41	2·26	1·10	0·16	1·26	0·56
42	9	40	1·79	0·78	0·05	0·83	0·46
43	9	34	1·52	0·68	0·07	0·75	0·49
44	10	39	2·15	1·10	0·10	1·20	0·56
45	9	38	1·70	0·97	0·10	1·07	0·63
46	8	35	1·23	0·74	0·10	0·84	0·68
47	7	28	0·75	0·44	0·06	0·50	0·67
48	9	37	1·65	0·88	0·08	0·96	0·58
49	6	30	0·59	0·35	0·04	0·39	0·66
50	8	38	1·34	0·78	0·08	0·86	0·64
Total ...	415	1744	73·92	35·68	2·99	38·67	26·12
Mean ...	8·30	34·88	1·48	0·71	0·60	7·73	0·5224

Form-factor = 38·67 ÷ 73·92 = 0·5231.

TUMALAPENTA PLANTATION—(*Continued*).

Plot E.

Calculation of Form-factor.

Number of Tree.	Girth at 5 feet.	Height of Tree.	Ideal Cylinder from Girth at 5 feet.	Cubic Content of Tree by Weighing.		True Cubic Content of Tree (5 + 6).	Reducing-factor (7 ÷ 4).
				Wood 72 lb. per Cubic Foot.	Twigs and Foliage 200 lb. per Cubic Foot.		
1	2	3	4	5	6	7	8
1	8	37	1·30	0·74	0·06	0·80	0·62
2	6	26	0·51	0·29	0·04	0·33	0·65
3	6	24	0·47	0·28	0·03	0·31	0·66
4	5	20	0·27	0·15	0·02	0·17	0·63
5	7	29	0·78	0·42	0·05	0·47	0·60
6	7	26	0·70	0·44	0·06	0·50	0·71
7	7	24	0·64	0·31	0·04	0·35	0·55
8	9	26	1·16	0·47	0·06	0·53	0·46
9	8	29	1·02	0·49	0·05	0·54	0·53
10	7	31	0·83	0·49	0·07	0·56	0·67
11	8	31	1·09	0·50	0·06	0·56	0·51
12	6	29	0·57	0·32	0·04	0·36	0·63
13	9	37	1·65	0·86	0·10	0·96	0·58
14	6	28	0·55	0·32	0·04	0·36	0·65
15	6	28	0·55	0·33	0·04	0·37	0·67
16	8	32	1·13	0·60	0·06	0·66	0·58
17	7	32	0·86	0·57	0·05	0·62	0·72
18	5	22	0·30	0·14	0·02	0·16	0·53
19	10	41	2·26	1·15	0·08	1·23	0·54
20	5	24	0·34	0·18	0·03	0·21	0·62
21	8	34	1·20	0·56	0·06	0·62	0·52
22	10	35	1·93	0·90	0·06	0·96	0·50
23	8	35	1·23	0·61	0·04	0·65	0·53
24	9	37	1·65	0·75	0·07	0·82	0·50
25	9	33	1·47	0·81	0·09	0·90	0·61
26	8	36	1·27	0·65	0·05	0·70	0·55
27	6	27	0·53	0·31	0·06	0·37	0·70
28	8	35	1·23	0·65	0·08	0·73	0·59
29	9	38	1·70	0·82	0·05	0·87	0·51
30	8	34	1·20	0·79	0·11	0·90	0·75
31	7	31	0·83	0·42	0·07	0·49	0·59
32	7	32	0·86	0·51	0·06	0·57	0·66
33	5	28	0·39	0·22	0·03	0·25	0·64
34	10	38	2·09	1·11	0·15	1·26	0·60
35	10	34	1·87	0·86	0·08	0·94	0·50
36	7	30	0·81	0·53	0·09	0·62	0·77
37	9	34	1·52	0·86	0·13	0·99	0·65
38	10	37	2·04	0·99	0·12	1·11	0·54
39	6	27	0·53	0·31	0·04	0·35	0·66
40	8	30	1·06	0·60	0·04	0·64	0·60
41	7	29	0·78	0·29	0·04	0·33	0·42
42	7	30	0·81	0·39	0·04	0·43	0·53
43	9	38	1·70	0·83	0·06	0·89	0·52
44	7	31	0·83	0·43	0·04	0·47	0·57
45	8	33	1·16	0·67	0·10	0·77	0·66
46	7	33	0·89	0·53	0·09	0·62	0·70
47	9	35	1·56	0·86	0·13	0·99	0·63
48	8	31	1·09	0·74	0·08	0·82	0·75
49	9	35	1·56	0·88	0·12	1·00	0·64
50	10	40	2·21	1·28	0·22	0·50	0·68
Sum	383	1576	54·98	29·21	3·40	32·61	30·18
Mean	...	...	...	...	...	...	0·6036

Form-factor 3,261 ÷ 5498 = 0·5931.

TUMALAPENTA PLANTATION—(*Continued*).

Sample Plot F.

Calculation of Form-factor.

Number of Tree.	Girth at 5 feet.	Height of Tree.	Ideal Cylinder from Girth at 5 feet.	Cubic Content of Tree by weighing.		True Cubic Content of Tree (5 + 6.)	Form-factor (7 ÷ 4.)
				Wood 72 lb. per Cubic foot.	Twigs and Foliage 200 lb. per Cubic foot.		
1	2	3	4	5	6	7	8
1	8	33	1·16	0·76	0·09	0·85	0·73
2	6	27	0·53	0·28	0·04	0·32	0·60
3	7	33	0·89	0·51	0·05	0·56	0·63
4	9	35	1·56	0·85	0·09	0·94	0·60
5	11	37	2·47	1·32	0·18	1·50	0·61
6	9	33	1·47	0·76	0·16	0·92	0·63
7	8	32	1·13	0·56	0·08	0·64	0·57
8	7	30	0·81	0·47	0·07	0·54	0·67
9	8	30	1·06	0·58	0·11	0·69	0·65
10	9	33	1·47	0·82	0·14	0·96	0·65
11	7	28	0·75	0·40	0·11	0·51	0·67
12	7	26	0·70	0·46	0·07	0·53	0·76
13	7	31	0·83	0·46	0·04	0·50	0·60
14	10	37	2·04	1·04	0·15	1·19	0·58
15	9	35	1·56	0·78	0·08	0·86	0·55
16	9	36	1·61	0·72	0·06	0·78	0·48
17	5	26	0·36	0·22	0·03	0·25	0·69
18	8	28	0·99	0·31	0·06	0·37	0·37
19	5	25	0·35	0·22	0·03	0·25	0·71
20	6	31	0·61	0·42	0·03	0·45	0·74
21	6	27	0·53	0·26	0·04	0·30	0·57
22	7	28	0·75	0·39	0·06	0·45	0·60
23	7	27	0·73	0·35	0·04	0·39	0·53
24	9	33	1·47	0·79	0·09	0·88	0·60
25	9	31	1·38	0·65	0·10	0·75	0·54
26	7	26	0·70	0·33	0·07	0·40	0·57
27	6	27	0·53	0·28	0·05	0·33	0·62
28	7	25	0·67	0·32	0·05	0·37	0·55
29	9	31	1·38	0·78	0·11	0·89	0·64
30	7	30	0·81	0·42	0·04	0·46	0·57
31	11	38	2·54	1·18	0·15	1·33	0·52
32	6	26	0·51	0·29	0·05	0·34	0·67
33	7	27	0·73	0·46	0·06	0·52	0·71
34	9	33	1·47	0·78	0·11	0·89	0·61
35	7	32	0·86	0·53	0·06	0·59	0·69
36	7	30	0·81	0·54	0·07	0·61	0·75
37	7	29	0·78	0·49	0·07	0·56	0·72
38	8	33	1·16	0·50	0·05	0·55	0·47
39	9	31	1·38	0·78	0·15	0·93	0·67
40	9	26	1·16	0·42	0·05	0·47	0·41
41	6	28	0·55	0·32	0·05	0·37	0·67
42	8	34	1·20	0·67	0·14	0·81	0·68
43	8	30	1·06	0·43	0·06	0·49	0·46
44	7	28	0·75	0·33	0·05	0·38	0·51
45	7	30	0·81	0·51	0·10	0·61	0·75
46	6	25	0·49	0·26	0·03	0·29	0·59

TUMALAPENTA PLANTATION—(*Continued*).

Sample Plot F—(*Continued*).

Calculation of Form-factor—(Continued).

Number of Tree.	Girth at 5 feet.	Height of Tree.	Ideal Cylinder from Girth at 5 feet.	Cubic Content of Tree by weighing.		True Cubic Content of Tree (5 + 6.)	Form factor (7 ÷ 4.)
				Wood 72 lb. per Cubic foot.	Twigs and Foliage 200 lb. per Cubic foot.		
1	2	3	4	5	6	7	8
47	9	32	1·43	0·72	0·11	0·83	0·58
48	9	33	1·47	0·83	0·10	0·93	0·63
49	8	28	0·99	0·54	0·09	0·63	0·64
50	9	34	1·52	0·79	0·13	0·92	0·61
Sum ...	386	1,518	52·97	27·88	4·02	31·88	30·62
Mean ...	7·72	30·36	1·059	0·557	0·80	0·637	0·612

Form-factor 31·88 ÷ 52·97 = 0·60185.

TAMINAPATNAM PLANTATION.

Plot A.

Calculation of Form-factor.

Number of Tree.	Girth at 5 feet.	Total Height of Tree.	Ideal Cylinder from girth at 5 feet.	Cubic Content from 10 feet section of stem.	Cubic Content of Top by Weighing.		True Cubic Content of Tree (5 + 6)	Form-factor (7 ÷ 4)
					Branch-wood at 70 lb. per Cubic Foot.	Twigs and Foliage at 200 lb. per Cubic Foot.		
1	2	3	4	5	6	7	8	9
1 ...	7	41	1·11	..	0·61	0·07	0·68	0·61
2 ...	9	42	1·88	...	1·03	0·10	1·13	0·60
3 ...	8	36	1·27	...	0·70	0·12	0·82	0·65
4 ...	9	39	1·74	...	1·01	0·14	1·15	0·66
5 ...	7¾	36	1·20	...	0·81	0·07	0·88	0·73
6 ...	10	42	2·32	...	1·69	0·12	1·81	0·78
7 ...	8	39	1·37	...	0·87	0·09	0·96	0·70
8 ...	7	38	1·02	...	0·70	0·07	0·77	0·75
9 ...	6	28	0·55	...	0·26	0·04	0·30	0·55
10 ...	7	33	0·89	...	0·53	0·06	0·59	0·66
11 ...	9	39	1·74	...	0·93	0·09	1·02	0·59
12 ...	8	36	1·27	...	0·71	0·06	0·77	0·61
13 ...	9	39	1·74	...	0·77	0·06	0·83	0·48
14 ...	5¾	27	0·49	...	0·21	0·03	0·24	0·49
15 ...	6	31	0·61	...	0·31	0·04	0·35	0·57
16 ...	6	36	0·71	...	0·41	0·04	0·45	0·63
17 ...	7¼	34	0·99	...	0·46	0·03	0·49	0·49
18 ...	7¼	40	1·16	...	0·63	0·06	0·69	0·59
19 ...	7	36	0·97	...	0·57	0·06	0·63	0·65
20 ...	8	37	1·30	...	0·70	0·06	0·76	0·58
21 ...	11¼	44	3·08	...	1·50	0·16	1·66	0·54
22 ...	5	33	0·45	...	0·19	0·02	0·21	0·47
23 ...	6¼	31	0·67	...	0·34	0·03	0·37	0·55
24 ...	6½	33	0·77	...	0·39	0·03	0·42	0·55
25 ...	5¼	26	0·40	...	0·19	0·02	0·21	0·53
26 ...	6	28	0·55	...	0·31	0·04	0·35	0·64
27 ...	5	25	0·35	...	0·21	0·02	0·23	0·66
28 ..	9½	39	1·95	...	0·89	0·09	0·98	0·50
29 ...	6	31	0·61	...	0·30	0·03	0·33	0·54
30 ...	11¾	37	2·82	...	1·63	0·14	1·77	0·63
31 ...	6¼	34	0·74	...	0·41	0·05	0·46	0·62
32 ...	13¼	47	4·56	...	2·47	0·27	2·74	0·60
33 ...	6¼	32	0·69	...	0·44	0·05	0·49	0·71
34 ...	17¾	55	9·58	...	4·63	0·43	5·06	0·53
35 ...	8¼	38	1·43	...	0·80	0·07	0·87	0·61
36 ...	7	36	0·97	...	0·70	0·06	0·76	0·78
37 ...	8¾	40	1·69	...	0·67	0·11	0·78	0·46
38 ...	5	25	0·35	...	0·20	0·03	0·23	0·66
39 ...	4¾	29	0·36	...	0·20	0·02	0·22	0·61
40 ...	9½	40	1·99	...	1·16	0·15	1·31	0·66
41 ...	13¼	48	4·66	...	2·73	0·19	2·92	0·63
42 ...	10¼	42	2·44	...	1·50	0·20	1·70	0·70
43 ...	5½	34	0·57	...	0·37	0·04	0·41	0·72
44 ...	8¼	39	1·47	...	0·80	0·08	0·88	0·60
45 ...	7	37	1·00	...	0·57	0·06	0·63	0·63
46 ...	6	35	0·69	...	0·44	0·03	0·47	0·68
47 ...	8	42	1·48	...	0·84	0·06	0·90	0·61
48 ...	7¼	37	1·08	...	0·63	0·04	0·67	0·62
49 ...	5½	30	0·50	...	0·19	0·03	0·22	0·44
50 ...	4½	26	0·29	...	0·17	0·02	0·19	0·66
51 ...	5	29	0·40	..	0·27	0·02	0·29	0·73

TAMINAPATNAM PLANTATION—(*Continued*).

Plot A—(*Continued*).

Calculation of Form-factor—(Continued).

Number of Tree.	Girth at 5 feet.	Total Height of Tree.	Ideal Cylinder from girth at 5 feet.	Cubic Content from 10 feet section of stem.	Cubic Content of Top by Weighing.		True Cubic Content of Tree (5 + 6)	Form-factor (9 ÷ 6)
					Branch-wood at 70 lb. per Cubic Foot.	Twigs and Foliage at 200 lb. per Cubic Foot.		
52 ...	6¼	32	0·69	...	0·29	0·02	0·31	0·45
53 ...	8	37	1·30	...	0·79	0·04	0·83	0·64
54 ...	6	29	0·57	...	0·31	0·03	0·34	0·60
55 ...	11	42	2·80	...	1·33	0·13	1·46	0·52
56 ...	10	43	2·37	...	1·63	0·17	1·80	0·76
57 ...	5	31	0·43	...	0·29	0·03	0·32	0·74
58 ...	6	29	0·57	...	0·30	0·06	0·36	0·63
59 ...	9¼	39	1·85	...	1·06	0·10	1·16	0·63
60 ...	6½	31	0·72	...	0·43	0·05	0·48	0·67
Total ...	459¾	2144	84·22	...	46·48	4·63	51·11	36·88
Mean ...	...	...	...	...	...	...	...	·6146

Form-factor 51·11 ÷ 84·22 = ·6069.

TAMINAPATNAM PLANTATION—(*Continued*).

Sample Plot B.

Calculation of Form-factor.

Number of Tree.	Girth at 5 feet.	Total Height of Tree.	Ideal Cylinder from Girth at 5 feet.	Cubic Content of Stem from 10 feet Sections.	Cubic Content of Top and Branches by Weighing.		True Content of Tree 5 + 6.	Form-factor 7 ÷ 4.
					Branch-wood at 70 lb. per Cubic Foot.	Twigs and Foliage at 200 lb. per Cubic Foot.		
1 ...	17	62	9·90	4·17	1·11	0·43	5·71	0·58
2 ...	10	43	2·37	0·90	0·27	0·10	1·27	0·54
3 ...	12	53	4·21	1·69	0·44	0·11	2·24	0·53
4 ...	10¼	47	2·73	0·88	0·21	0·09	1·18	0·43
5 ...	14	45	4·87	1·62	0·26	0·15	2·03	0·42
6 ...	11¼	47	3·29	1·56	0·50	0·14	2·20	0·67
7 ...	11¼	45	3·15	1·29	0·20	0·11	1·60	0·51
8 ...	13½	51	5·14	2·54	0·39	0·24	3·17	0·62
9 ...	10½	45	2·74	1·26	0·27	0·10	1·63	0·59
10 ...	10½	45	2·74	1·26	0·21	0·11	1·58	0·58
11 ...	15½	58	7·70	3·32	0·53	0·34	4·19	0·54
12 ...	9¾	49	2·58	1·31	0·09	0·15	1·55	0·60
13 ...	9¼	42	1·99	0·90	0·19	0·08	1·17	0·59
14 ...	10½	45	2·74	1·26	0·33	0·13	1·72	0·63
15 ...	9½	41	2·04	1·09	0·16	0·11	1·36	0·67
16 ...	8¾	38	1·61	0·85	0·14	0·10	1·09	0·68
17 ...	5¾	31	0·57	0·28	0·04	0·04	0·36	0·63
18 ...	9	48	2·14	1·20	0·10	0·08	1·38	0·64
19 ...	12½	51	4·40	2·08	0·19	0·21	2·48	0·56
20 ...	13¾	52	5·43	2·69	0·31	0·24	3·24	0·60
21 ...	12	50	3·97	1·83	0·21	0·15	2·19	0·55
22 ...	10¼	50	2·90	...	1·81	0·11	1·92	0·66
23 ...	11¾	47	3·59	...	1·84	0·15	1·99	0·55
24 ...	9¾	48	2·52	...	1·43	0·09	1·52	0·60
25 ...	9½	51	2·54	1·17	0·27	0·09	1·53	0·60
26 ...	7¼	44	1·28	0·55	0·13	0·04	0·72	0·56
27 ...	12	53	4·21	2·16	0·30	0·14	2·60	0·62
28 ...	8	41	1·45	0·54	0·27	0·07	0·88	0·61
29 ...	8½	41	1·64	0·71	0·31	0·07	1·09	0·67
30 ...	13¾	48	5·02	2·18	0·57	0·28	3·03	0·60
31 ...	11½	48	3·51	1·80	0·41	0·16	2·37	0·68
32 ...	13	46	4·29	2·27	0·61	0·27	3·15	0·73
33 ...	10½	47	2·86	1·37	0·29	0·13	1·79	0·63
34 ...	6¼	32	0·69	0·33	0·04	0·04	0·41	0·59
35 ...	9½	45	2·24	1·09	0·17	0·10	1·36	0·61
36 ...	5½	29	0·48	...	0·24	0·03	0·27	0·56
37 ..	6½	32	0·75	0·41	0·10	0·05	0·56	0·75
38 ...	5½	27	0·45	...	0·31	0·04	0·35	0·78
39 ...	7½	34	1·06	0·49	0·11	0·08	0·68	0·64
40 ..	7	28	0·75	0·41	0·11	0·07	0·59	0·79
41 ...	10	38	2·09	1·04	0·13	0·04	1·21	0·58
42 ..	12½	49	4·23	1·97	0·30	0·22	2·49	0·59
43 ...	10½	43	2·62	...	1·37	0·10	1·47	0·56
44 ...	10	45	2·48	...	1·51	0·16	1·67	0·67
45 ...	6	28	0·55	..	0·40	0·03	0·43	0·78
46 ...	9	35	1·56	0·72	0·04	0·09	0·85	0·54
47 ...	6	38	0·75	...	0·43	0·02	0·45	0·60
48 ...	7	40	1·08	...	0·67	0·02	0·69	0·64
49 ...	6	28	0·55	...	0·27	0·03	0·30	0·55
50 ...	6	33	0·65	..	0·34	0·02	0·36	0·55
51 ...	7	29	0·78	...	0·39	0·04	0·43	0·55

TAMINAPATNAM PLANTATION—(*Continued*).

SAMPLE PLOT B—(*Continued*).

Calculation of Form-factor—(Continued).

Number of Tree.	Girth at 5 feet.	Total Height of Tree.	Ideal Cylinder from Girth at 5 feet.	Cubic Content of Stem from 10 feet Sections.	Cubic Content of Top and Branches by Weighing.		True Content of Tree 5 + 6.	Form-factor 7 ÷ 4.
					Branch-wood at 70 lb. per Cubic Foot.	Twigs and Foliage at 200 lb. per Cubic Foot.		
52 ...	7	36	0·97	..	0·44	0·03	0·47	0·48
53 ...	9½	31	1·55	...	1·07	0·11	1·18	0·76
54 ...	8½	47	1·88	...	1·07	0·06	1·13	0·60
55 ...	9½	44	2·19	1·09	0·16	0·11	1·36	0·62
56 ...	7¾	37	1·23	0·54	0·13	0·06	0·73	0·59
57 ...	6	34	0·67	0·33	0·04	0·03	0·40	0·60
58 ...	9	40	1·79	0·93	0·11	0·11	1·15	0·64
59 ...	8½	32	1·28	0·58	0·21	0·09	0·88	0·70
60 ...	8¾	34	1·44	0·71	0·20	0·16	1·07	0·74
Total ...	574½	2,520	148·88	57·37	24·75	6·75	88·87	36·73
Mean ...	...	...	...	...	...	...	...	0·6121

Form-factor = 88·87 ÷ 148·88 = ·597.

KOTTAPATAM PLANTATION.

Sample Plot A.

Calculation of Form-factor.

Number of Tree.	Girth at 5 feet.	Total Height of Tree.	Ideal Cylinder from Girth at 5 feet.	Cubic Content from 10 feet Sections of Stem.	Cubic Content of Top by Weighing.		True Cubic Content of Tree 5 + 6.	Form-factor 7 ÷ 4.
					Branch-wood at 70 lb. per Cubic Foot.	Twigs and Foliage at 200 lb. per Cubic Foot.		
1 ...	12¾	47	4·22	2·03	0·56	0·16	2·75	0·65
2 ...	17¼	72	11·84	4·77	1·03	0·27	6·07	0·51
3 ...	8⅓	47	1·88	0·98	0·19	0·06	1·23	0·65
4 ...	8	44	1·55	0·76	0·11	0·07	0·94	0·61
5 ...	10¾	56	3·58	1·83	0·24	0·09	2·16	0·60
6 ...	10¼	44	2·56	1·34	0·19	0·09	1·62	0·63
7 ...	8⅓	45	1·80	0·90	0·11	0·07	1·08	0·60
8 ...	6¼	35	0·76	0·33	0·10	0·04	0·47	0·62
9 ...	15¾	57	7·82	3·16	1·00	0·25	4·41	0·56
10 ...	15¼	62	7·97	2·87	1·13	0·22	4·22	0·53
11 ...	7½	42	1·31	0·68	0·09	0·04	0·81	0·62
12 ...	11	48	3·20	1·37	0·21	0·15	1·73	0·54
13 ...	12	54	4·29	1·88	0·13	0·17	2·18	0·51
14 ...	12¾	54	4·85	2·30	0·26	0·16	2·72	0·56
15 ...	16	64	9·05	4·10	0·50	0·34	4·94	0·55
16 ...	9	47	2·10	0·98	0·18	0·05	1·21	0·58
17 ...	13¼	52	5·05	2·30	0·26	0·18	2·74	0·54
18 ...	12	46	3·66	1·50	0·25	0·11	1·86	0·51
19 ...	6	35	0·69	0·28	0·06	0·02	0·36	0·52
20 ...	7	45	1·21	0·60	0·06	0·03	0·69	0·57
21 ..	8⅓	44	1·76	0·76	0·07	0·07	0·90	0·51
22 ...	12⅓	56	4·84	2·05	0·31	0·16	2·52	0·52
23 ...	13¾	58	6·06	3·05	0·21	0·17	3·43	0·57
24 ...	10	41	2·26	1·09	0·09	0·10	1·28	0·57
25 ...	7½	40	1·24	0·46	0·13	0·03	0·62	0·50
26 ...	7	40	1·08	0·46	0·13	0·04	0·63	0·58
27 ...	16¾	60	9·30	4·31	0·70	0·28	5·29	0·57
28 ...	14¾	57	6·86	2·83	1·13	0·25	4·21	0·61
29 ...	12	51	4·05	1·88	0·30	0·19	2·37	0·59
30 ...	10¼	53	3·08	1·45	0·17	0·11	1·73	0·56
31 ...	8¼	43	1·62	0·62	0·30	0·11	1·03	0·64
32 ...	14	56	6·06	2·45	0·61	0·13	3·19	0·53
33 ...	11¼	43	3·01	1·29	0·46	0·17	1·92	0·64
34 ...	10	50	2·76	1·09	0·26	0·04	1·39	0·50
35 ...	9	44	1·96	0·85	0·17	0·07	1·09	0·56
36 ...	10¼	42	2·44	1·18	0·20	0·14	1·52	0·62
37 ...	14	55	5·95	2·58	0·40	0·22	3·20	0·54
38 ...	6⅓	37	0·86	0·46	0·14	0·03	0·63	0·73
39 ...	12	63	5·01	2·16	0·43	0·09	2·68	0·53
40 ...	12	57	4·53	1·88	0·36	0·13	2·37	0·52
41 ...	9	45	2·01	0·98	0·11	0·08	1·17	0·58
42 ...	15¼	57	7·33	3·23	0·91	0·30	4·44	0·61
43 ...	7¼	41	1·19	0·55	0·10	0·04	0·69	0·58
44 ...	12	58	4·61	2·24	0·33	0·14	2·71	0·59
45 ...	9⅓	48	2·39	1·17	0·24	0·07	1·48	0·62
46 ...	10⅓	47	2·86	1·51	0·11	0·09	1·71	0·60
47 ...	8⅓	42	1·68	0·85	0·13	0·09	1·07	0·64
48 ...	11⅓	51	3·73	1·88	0·29	0·17	2·34	0·63
49 ...	7¾	43	1·43	0·68	0·07	0·07	0·82	0·57
50 ...	11	48	3·20	1·45	0·39	0·12	1·96	0·61
Sum ...	542¼	2466	184·55	82·40	15·91	6·27	104·58	28·88
Mean ...	...	...	...	...	...	...	...	0·5776

Form-factor 104·58 ÷ 184·55 = 0·56667.

KOTTAPATAM PLANTATION—(*Continued*).

Sample Plot B.

Calculation of Form-factor.

Number of Tree.	Girth at 5 feet.	Total Height of Tree.	Ideal Cylinder from Girth at 5 feet.	Cubic Content from 10 feet Section of Stem.	Cubic Content of Top by weighing.		True Cubic Content of Tree (5 + 6).	Form-factor 7 ÷ 4.
					Branch wood at 70 lb. per Cubic Foot.	Twigs and Foliage at 200 lb. per Cubic Foot.		
1	2	3	4	5	6		7	8
1 ...	8¾	40	1·69	0·85	0·09	0·05	0·99	0·59
2 ...	5	27	0·37	...	0·21	0·04	0·25	0·68
3 ...	7	36	0·97	...	0·51	0·07	0·58	0·60
4 ...	6	29	0·57	...	0·39	0·04	0·43	0·75
5 ...	10	52	2·87	1·48	0·14	0·09	1·71	0·60
6 ...	8¾	44	1·86	0·98	0·17	0·09	1·24	0·67
7 ...	15½	49	6·51	2·89	0·43	0·15	3·47	0·53
8 ...	9¼	50	2·37	1·06	0·27	0·10	1·43	0·60
9 ...	9	43	1·92	0·85	0·09	0·09	1·03	0·54
10 ...	11½	46	3·36	1·83	0·10	0·18	2·11	0·63
11 ...	11	49	3·27	1·59	0·09	0·17	1·85	0·57
12 ...	7	39	1·05	0·46	0·11	0·05	0·62	0·59
13 ...	6¾	33	0·83	0·41	0·10	0·05	0·56	0·67
14 ...	10	44	2·43	1·09	0·14	0·12	1·35	0·56
15 ...	16¾	61	9·46	4·09	0·59	0·39	5·07	0·54
16 ...	7¾	46	1·53	0·68	0·11	0·05	0·84	0·55
17 ...	10	49	2·70	1·40	0·13	0·12	1·65	0·61
18 ...	7¼	34	0·99	...	0·51	0·07	0·58	0·59
19 ...	10	51	2·81	1·40	0·07	0·14	1·61	0·57
20 ...	10	46	2·54	1·09	0·17	0·06	1·32	0·52
21 ...	15½	56	7·43	3·35	0·63	0·29	4·27	0·57
22 ...	10	45	2·48	1·17	0·21	0·12	1·50	0·60
23 ...	11¾	56	4·27	2·05	0·19	0·15	2·39	0·56
24 ...	7¼	39	1·13	0·46	0·13	0·06	0·65	0·58
25 ...	8½	38	1·52	0·63	0·11	0·03	0·77	0·51
26 ...	6½	34	0·79	0·41	0·10	0·04	0·55	0·70
27 ...	7¼	31	0·90	0·41	0·09	0·12	0·62	0·69
28 ...	16	51	7·21	3·24	0·43	0·19	3·86	0·54
29 ...	10	47	2·59	1·17	0·19	0·08	1·44	0·56
30 ...	6¼	34	0·74	0·33	0·06	0·03	0·42	0·57
31 ...	8	42	1·48	0·76	0·19	0·10	1·05	0·71
32 ...	11	43	2·87	1·29	0·36	0·16	1·81	0·63
33 ...	5	30	0·41	...	0·22	0·02	0·24	0·59
34 ...	9½	36	1·80	0·74	0·12	0·07	0·93	0·52
35 ...	8¾	45	1·91	0·85	0·13	0·07	1·05	0·55
36 ...	13	56	5·23	2·11	0·30	0·20	2·61	0·50
37 ...	5¾	31	0·57	0·28	0·03	0·03	0·34	0·60
38 ...	12	54	4·29	1·97	0·27	0·19	2·43	0·57
39 ..	9	47	2·10	0·98	0·13	0·05	1·16	0·55
40 ...	9¼	48	2·27	0·98	0·20	0·09	1·27	0·56
41 ...	11	49	3·27	1·37	0·34	0·17	1·88	0·57
42 ...	8½	44	1·76	0·98	0·16	0·09	1·23	0·70
43 ...	11	56	3·74	1·84	0·29	0·10	2·23	0·60
44 ...	8¾	39	1·65	0·85	0·07	0·08	1·00	0·61
45 ...	8	45	1·59	0·76	0·10	0·05	0·91	0·57
46 ...	6½	32	0·75	0·41	0·09	0·05	0·55	0·73
47 ...	8¼	38	1·43	0·76	0·06	0·06	0·88	0·62
48 ...	10½	43	2·62	1·20	0·16	0·09	1·45	0·55
49 ...	7½	39	1·21	0·63	0·04	0·07	0·79	0·65
50 ...	10½	48	2·92	1·34	0·06	0·10	1·50	0·51
Total ...	468	2,164	123·03	55·52	9·88	5·07	70·47	29·73
Mean ...	...	...	...	...	...	...	...	0·5946

Form-factor = 70·47 ÷ 123·03 = 0·57278.

KOTTAPATAM PLANTATION—(*Continued*).

Plot C.

Margin Trees planted by Fishermen.

Number of Tree.	Girth at 5 feet.	Height of Tree.	Ideal Cylinder.	Number of Tree.	Girth at 5 feet.	Height of Tree.	Ideal Cylinder.
1	2	3	4	1	2	3	4
1	38	70	55·85	34	34	57	36·41
2	38	62	49·47	35	23	59	17·24
3	42	62	60·43	36	29	65	30·20
4	25	62	21·41	37	25	61	21·06
5	28	59	25·56	38	28	62	26·86
6	35	62	41·97		24	63	20·05
7	28	57	24·69	39	27	59	23·76
8	29	65	30·20	40	28	58	25·12
9	23	62	18·12	41	28	61	26·42
10	34	62	39·60	42	27	59	23·76
11	30	62	30·83	43	24	58	18·46
12	32	62	35·08	44	27	55	22·15
13	43	55	56·19	45	23	55	16·07
14	27	55	22·15	46	30	60	29·84
15	22	52	13·90	47	24	63	20·05
16	33	63	37·91	48	23	58	16·95
17	32	59	33·38	49	21	59	14·37
18	38	69	55·06	50	29	55	25·56
19	37	66	49·93	51	20	59	13·04
20	29	51	23·70	52	23	54	15·78
21	28	64	27·72	53	23	54	15·78
22	28	58	25·12	54	25	45	15·54
23	22	45	12·03	55	20	52	11·49
24	26	55	20·54	56	20	47	10·38
25	25	56	19·34				
26	24	59	18·78	Total ...	1,595	3,358	1528·16
27	26	66	24·65				
28	25	56	19·34				
29	32	61	34·51	Average ...	28·48	59·96	27·29
30	27	60	24·17				
31	27	60	24·17	Maximum ...	43	70	60·43
32	26	59	22·04				
33	31	64	33·98	Minimum ...	20	45	10·38

Average growth.

$$\text{The Individual-increment} = \frac{1528{\cdot}16 \times 0{\cdot}57}{56 \times 10} = 1{\cdot}55549 \text{ cubic ft.}$$

$$i.e., \frac{\text{Ideal-cylinders} \times \text{Form-factor.}}{\text{No. of trees} \times \text{Age of trees.}}$$

KOTTAPATAM PLANTATION—(*Continued*).

Sample Trees.

Calculation of Form-factor.

Number of Tree.	Girth at 5 feet.	Total Height of Tree.	Ideal Cylinder from Girth at 5 feet.	Cubic Content of Stem from 10 feet Sections.	Cubic Content of Top and Branches by weighing.		True Cubic Content of Tree 5 + 6.	Form-factor 7 ÷ 4.
					Branch wood at 70 lb. per Cubic Foot.	Twigs and Foliage at 200 lb. per Cubic Foot.		
1	2	3	4	5	6		7	8
1 ...	33	62	37·31	14·85	5·43	2·38	22·66	0·61
2 ...	26	58	21·66	8·61	2·21	1·05	11·87	0·55
3 ...	25	60	20·72	8·11	3·91	0·98	13·00	0·63
4 ...	29	58	26·95	10·25	6·09	1·29	17·63	0·65
5 ...	36	69	49·41	16·51	7·61	2·44	26·56	0·54
6 ...	21	59	14·37	5·46	2·90	0·50	8·86	0·62
7 ...	19	61	12·16	4·66	2·43	0·26	7·35	0·60
8 ...	25	60	20·72	7·73	1·91	0·88	10·52	0·51
9 ...	20	56	12·37	4·46	1·70	0·36	6·52	0·53
10 ...	23	61	17·83	6·96	1·39	0·75	9·10	0·51
Sum ...	257	604	233·50	87·60	35·58	10·89	134·07	5·75
Mean ...	25·7	60·4	23·35	8·76	3·56	1·09	13·41	0·575

Form-factor 134·07 ÷ 233·50 = 0·57417.

DUGARAZPATNAM PLANTATION.

Plot A.

A small piece 0·0322 Acre in a Private Plantation.

Trees three years old, growing on manured wet land. Measured on account of the fine appearance of the growth.

Number of Tree.	Girth at 5 feet.	Height of Tree.	Ideal Cylinder.	Number of Tree.	Girth at 5 feet.	Height of Tree.	Ideal Cylinder.
1	2	3	4	1	2	3	4
1	9	30	1·34	24	8	30	1·06
2	8	29	1·02	25	5	20	0·27
3	9	30	1·34	26	6	30	0·59
4	10	33	1·82	27	5	24	0·34
5	7	26	0·70	28	9	31	1·38
6	9	30	1·34	29	8	29	1·02
7	3	12	0·06	30	7	29	0·78
8	9	27	1·20	31	7	30	0·81
9	6	26	0·51	32	8	34	1·20
10	9	34	1·52	33	8	30	1·06
11	13	36	3·36	34	8	31	1·09
12	12	35	2·78	35	9	30	1·34
13	6	25	0·49	36	6	26	0·51
14	9	33	1·47	37	8	30	1·06
15	4	21	0·18	38	6	21	0·41
16	9	30	1·34				
17	7	27	0·73	Total ...	291	1,083	39·50
18	6	26	0·51				
19	6	25	0·49	Average ...	7·66	28·50	1·04
20	8	33	1·16				
21	9	31	1·38	Maximum ...	13	36	3·36
22	8	30	1·06				
23	7	29	0·78	Minimum ...	3	12	0·06

DUGARAZPATNAM PLANTATION—(*Continued*).

PLOT A—(*Continued*).

Calculation of Results.

The factor used is 0·60 obtained from planting at this distance and one year older at Tumalapenta F. Sample-area.

Total stock on Sample-area 39·50 × 0·60 = 23·70 cubic feet.
Stock per acre = 23·70 ÷ 0·0322 = 736·02 cubic feet.
Total number of trees on Sample-area is 38.
Do. do. per acre 38 ÷ 0·0322 = 1180·12 trees.
Actual stock on the ground per acre is 736·02 c. ft. in 1180·12 trees.

Yearly Individual-increment 736·02 cubic feet ÷ 1180·12 trees ÷ 3 years = 0·20789.

Blanks and Thinnings.

There have been no thinnings, and there are no blanks.

$$\text{Yearly Acre-increment} = \frac{\text{Actual stock} + \text{Blanks} + \text{Thinnings}}{\text{Present Age}}$$

$$= \frac{736{\cdot}02 + 0{\cdot}0 + 0{\cdot}0}{} = 245{\cdot}34 \text{ c. ft.}$$

or (at 45 c. ft. per ton) 5·452 tons.

DUGARAZPATNAM PLANTATION—(*Continued*).

Isolated Trees on Buckingham Canal, 3 Miles South of Dugarázpatnam, 20 Years of Age, originally planted 15 × 15 one Row, now many Gaps.

Number of Tree.	Girth at 5 feet.	Height of Tree.	Ideal Cylinder.	Number of Tree.	Girth at 5 feet.	Height of Tree.	Ideal Cylinder.
1	2	3	4	1	2	3	4
1	49	64	84·91	36	29	50	23·23
2	45	63	70·50	37	35	58	39·26
3	57	61	109·52	38	42	45	43·86
4	44	66	70·61	39	49	53	70·32
5	60	64	127·32	40	35	55	37·23
6	57	63	113·11	41	40	51	45·09
7	50	49	67·69	42	43	43	43·93
8	31	50	26·55	43	42	53	51·66
9	53	50	77·61	44	49	53	70·32
10	31	44	23·36	45	57	55	98·75
11	42	54	52·64	46	43	52	53·13
12	40	46	40·67	47	57	65	116·70
13	37	57	43·12	48	40	58	51·28
14	34	50	31·94	49	38	48	38·30
15	39	50	42·02	50	41	57	52·95
16	34	49	31·30	51	38	45	35·90
17	32	46	26·03	52	42	56	54·58
18	37	49	37·07	53	43	57	58·24
19	37	52	39·34	54	33	55	33·09
20	37	50	37·82	55	28	50	21·66
21	30	55	27·35	56	47	58	70·80
22	42	65	63·36	57	29	58	26·95
23	45	62	69·38	58	36	60	42·97
24	55	67	112·00	59	29	48	22·30
25	55	61	101·97	60	44	65	69·54
26	45	56	62·66	61	43	61	62·32
27	30	45	22·38	62	35	49	33·17
28	38	54	43·09	63	38	45	35·90
29	46	64	74·83	64	44	46	49·21
30	42	62	60·43	65	35	45	30·46
31	33	61	36·71	66	36	44	31·51
32	49	66	87·57	67	31	54	28·67
33	32	47	26·59	68	39	62	52·11
34	48	68	86·58	69	50	58	80·12
35	37	66	49·93	70	32	37	20·93

Isolated Trees on Buckingham Canal, 3 Miles South of Dugarázpatnam, 20 Years of Age, originally planted 15 × 15 one Row, now many Gaps.—(Continued).

Number of Tree.	Girth at 5 feet.	Height of Tree.	Ideal Cylinder.	Number of Tree.	Girth at 5 feet.	Height of Tree.	Ideal Cylinder.
1	2	3	4	1	2	3	4
71	31	50	26·55	134	29	47	21·84
72	25	38	13·12	135	48	75	95·49
73	30	41	20·39	136	46	49	57·29
74	35	51	34·52	137	34	41	26·19
75	38	43	34·31	138	49	63	83·59
76	33	44	26·47	139	32	34	19·24
77	48	58	73·84	140	30	51	25·36
78	43	63	64·37	141	39	58	48·75
79	34	60	38·32	142	47	77	93·99
80	23	47	13·73	143	44	51	54·56
81	33	57	34·30	144	30	55	27·35
82	29	53	24·63	145	37	50	37·82
83	38	57	45·48	146	25	43	14·85
84	26	38	14·19	147	39	61	51·27
85	25	49	16·92	148	43	51	52·11
86	37	46	34·80	149	39	54	45·38
87	30	45	22·38	150	41	50	46·44
88	36	47	33·66	151	51	56	80·49
89	32	42	23·76	152	29	48	22·30
90	40	46	40·67	153	51	57	81·93
91	38	42	33·51	154	40	59	52·16
92	33	58	34·90	155	33	60	36·10
93	39	58	48·75	156	34	58	37·05
94	30	59	29·34	157	26	53	19·79
95	23	44	12·86	158	28	56	24·26
96	47	60	73·24	159	36	40	28·64
97	26	40	14·94	160	36	75	53·71
98	34	40	25·55	161	25	43	14·85
99	38	46	36·70	162	32	46	26·03
100	40	50	44·20	163	29	45	20·91
101	27	40	16·11	164	25	35	12·08
102	35	50	33·84	165	20	50	11·05
103	29	48	22·30	166	45	47	52·59
104	24	52	16·55	167	58	65	120·83
105	31	53	28·14	168	38	68	54·26
106	34	50	31·94	169	43	78	79·70
107	47	52	63·47	170	36	60	42·97
108	50	51	70·45	171	39	59	49·59
109	31	50	26·55	172	24	43	13·68
110	32	56	31·68	173	21	53	12·91
111	45	60	67·14	174	39	63	52·95
112	31	38	20·18	175	30	56	27·85
113	39	62	52·11	176	39	60	50·43
114	47	61	74·46	177	28	30	12·99
115	40	60	53·05	178	41	54	50·16
116	41	57	52·95	179	25	40	13·81
117	39	60	50·43	180	21	58	14·13
118	37	58	43·87	181	27	48	19·33
119	39	59	49·59	182	46	78	91·20
120	30	58	28·84	183	40	56	49·51
121	32	41	23·20	184	25	46	15·88
122	26	60	22·41	185	58	83	154·29
123	30	60	29·84	186	36	56	40·10
124	26	40	14·94	187	28	42	18 19
125	55	49	81·91	188	49	85	112·78
126	38	50	39·89	189	42	73	71·16
127	41	78	72·45	Total ...	952	1,531	1265·33
128	38	63	50·27	Average ...	38·01	48·74	47·36
129	68	72	183·98				
130	71	61	169·93	Maximum ...	71	85	183·98
131	37	62	46·90				
132	34	50	31·94	Minimum ...	20	30	11·05
133	35	61	41·29				

Average growth.

$$\text{Individual-increment} = \frac{\text{Ideal-cylinders} \times \text{Form-factor}}{\text{No. of trees} \times \text{Age}} = \frac{8951{\cdot}56 \times 0{\cdot}50}{189 \times 20} = 1{\cdot}18403.$$

Isolated Casuarinas growing in a Row by the side of the Buckingham Canal and of the Pulicat Lake at Sriharikót.

Number of Tree.	Girth at 5 feet.	Height of Tree.	Ideal Cylinder.	Number of Tree.	Girth at 5 feet.	Height of Tree.	Ideal Cylinder.
1	59	60	115·42	26	57	92	165·18
2	65	70	163·43	27	53	88	136·60
3	58	73	135·70	28	46	68	79·51
4	51	76	109·24	29	59	71	136·58
5	66	57	137·21	30	60	70	139·26
6	52	68	101·61	31	61	62	103·49
7	53	74	114·87	32	51	72	103·49
8	52	72	107·58	33	44	68	72·75
9	58	67	124·55	34	46	65	76·00
10	49	63	83·59	35	60	75	149·20
11	55	83	138·74	36	76	80	255·36
12	50	60	82·89	37	62	90	191·19
13	49	65	86·24	38	69	94	247·32
14	74	97	293·54	39	60	89	177·06
15	47	71	86·67	40	51	85	122·17
16	70	92	249·12	41	62	98	208·18
17	71	90	250·72				
18	44	85	90·93	Total ...	2,333	31·92	5899·94
19	46	86	100·56				
20	54	89	143·41				
21	62	84	178·44	Average ...	56·90	77·85	143·90
22	61	80	164·50				
23	57	82	147·22	Maximum ...	76	99	293·54
24	63	99	217·14				
25	50	82	113·28	Minimum ...	44	57	72·75

Average growth.

$$\text{Individual-increment} = \frac{\text{Ideal-cylinders} \times \text{Form-factor}}{\text{No. of trees} \times \text{Age of trees}} = \frac{5899{\cdot}94 \times 0{\cdot}50}{41 \times 20} = 3{\cdot}60 \text{ cubic feet.}$$

The Form-factor is here assumed at 0·50. In the ten years' old margin trees at Kottapatam C it is 0·57; in the 17 years' old isolated trees at Kistnapatam it was assumed at 0·55.

Isolated Casuarina Trees at Kistnapatam Plantation stated by the Salt Department to be 19·3 *Years of Age.*

Number of Tree.	Girth at 5 feet.	Height of Tree.	Ideal Cylinder.	Number of Tree.	Girth at 5 feet.	Height of Tree.	Ideal Cylinder.
1	46	63	73·66	10	43	71	72·54
2	40	66	58·35				
3	48	60	76·39	Sum ...	447	662	732·87
4	39	67	56·31				
5	39	67	56·31	Average ...	44·70	66·20	73·29
6	43	78	79·70				
7	51	67	96·30	Maximum ...	52	78	96·30
8	46	63	73·66				
9	52	60	89·65	Minimum ...	39	60	56·31

$$\text{Individual-increment taking the Form-factor at } 0{\cdot}55 = \frac{73{\cdot}29 \times 0{\cdot}55}{19{\cdot}3} = 2{\cdot}08857 \text{ cubic feet.}$$

Statement of Casuarina Plantations with Extent, Number of Trees, &c., in Nellore District.

Name of the Village or Plantations.	Extent.		Number of Trees.	When planted.	Amount of Estimate.			Actual Expenditure up to 31st December 1882.			Distance at which the Trees are planted.	Remarks.
1	2		3	4	5			6			7	8
Gúdúr Taluk.	A.	C.			RS.	A.	P.	RS.	A.	P.		
Taminapatam 1st Plantation.	60	0	30,000	1st Dec. 1873.	7,711	8	0	7,681	2	6	4½ feet apart.	The first plantation was at first planted at 9 feet apart, but this having been objected to by the Collector, intermediate trees at 4½ feet apart were interplanted under the Collector's Order, No. 951, dated 8th May 1874. The same order was followed in planting the 2nd and 3rd plantations in all the villages of the principal division.
Do. Additional Plantation.	...*		90,000	1st Jan. 1875.	6,000	0	0	4,418	2	6		
Do. 2nd Plantation.	50	0	60,000	1st Feb. „	9,593	1	2	9,593	0	5	4½ „	
Do. 3rd do. ...	60	0	56,000	20th Oct. „	7,878	3	0	7,878	0	6	4½ „	
Do. 4th do. ...	60	0	30,000	12th Dec. 1880.	7,822	7	2	2,098	7	11	9 „	
Do. 5th do. ...	160	0	80,000	1st Nov. 1881.	11,087	0	0	2,564	13	5	9 „	
Total ...	390	0	346,000	...	50,092	3	4	34,233	11	3	...	
Kottapatam 1st Plantation ...	30	0	15,000	5th Dec. 1873.	4,040	0	0	3,961	7	2	4½ feet apart.	2. A question having arisen in 1877 as to the distance at which trees should be planted, the Conservator of Forests advised to plant them at 6 feet apart, *vide* his letter, No. 978, 13th November 1877, and this advice was followed in regard to plantations formed in 1878.
Do. Additional Plantation.	...†		45,000	1st Jan. 1875.	2,043	3	6	2,043	3	6		
Do. 2nd Plantation.	30	0	50,000	1st Feb. „	6,554	15	3	6,526	2	9	4½ „	
Do. 3rd do. ...	40	0	40,000	17th Oct. „	6,306	12	7	6,187	4	0	4½ „	
Do. 4th do. ...	50	0	30,000	4th Dec. 1880.	7,798	10	3	1,795	15	5	9 „	
Do. 5th do. ...	140	0	80,000	1st Nov. 1881.	9,573	12	0	2,121	5	7	9 „	
Total ...	290	0	260,000	...	36,317	5	7	22,635	6	5	...	
Dugarázpatnam 1st Plantation.	50	0	25,000	17th Dec. 1873.	6,641	12	0	6,384	5	10	4½ feet apart.	3. But experience having shown this distance to be still too close, 4th and 5th plantations were planted at 9 feet apart.
Do. Additional Plantation.	...‡		75,000	1st Feb. 1875.	4,000	0	0	3,747	4	10		
Do. 2nd Plantation.	50	0	50,000	4th Dec. 1874.	6,757	2	9	6,754	4	3	4½ „	4. Further experience showed that it is more profitable to plant at 12 feet apart, and the plantations now being formed are planted at this distance. 28,000 trees have been planted this year (1882-83) at 12 × 12.
Do. 3rd do. ...	40	0	60,000	18th Oct. 1875.	6,449	3	8	6,448	15	11	4½ „	
Do. 4th do. ...	50	0	30,000	5th Dec. 1880.	6,726	9	3	1,771	0	6	9 „	
Do. 5th do. ...	100	0	50,000	1st Nov. 1881.	7,448	12	0	1,835	8	3	9 „	
Total ...	290	0	290,000	...	38,023	7	8	26,941	7	7	...	

* Probably about 60 acres. † Probably about 30 acres. ‡ Probably about 50 acres.

Statement of Casuarina Plantations with Extent, Number of Trees, &c., in Nellore District—(Continued).

Name of the Village or Plantations.	Extent.	Number of Trees.	When planted.	Amount of Estimate.	Actual Expenditure up to 31st December 1882.	Distance at which the Trees are planted.	Remarks.
1	2	3	4	5	6	7	8
Gúdúr Taluk—(Contd.)	A. C.			RS. A. P.	RS. A. P.		
Tope at Kistnapatam Salt Cotaur.	5 25	208	...	50 0 0	50 0 0	...	
Do. Dugarázpatnam do.	9 18	220	...	142 0 0	142 0 0	...	
Do. do. Travellers' Bungalow.	0 78	20	...	...	...	...	
Total ...	15 21	448	...	192 0 0	192 0 0	...	
Total for Gúdúr Taluk ...	985 21	896,448	..	1,24,625 0 7	84,002 9 3	..	
Nellore Taluk.							
Vutukuru 1st Plantation ...	40 0	52,000	22nd Oct. 1875.	7,556 10 2	7,544 8 6	4½ feet.	
Do. 2nd do. ...	40 0	30,000	12th Nov. 1880.	7,847 0 5	2,197 13 10	9 „	
Do. 3rd do. ...	100 0	50,000	1st „ 1881.	7,448 12 0	1,782 9 0	9 „	
Total ...	180 0	132,000	...	22,852 6 7	11,524 15 4	...	
Varany 1st Plantation ...	50 0	25,000	1st Jan. 1874.	6,641 12 0	6,545 8 3	4½ feet apart.	
Do. Additional Plantation.	...*	75,000	1st „ 1875.	4,000 0 0	3,793 11 6		
Do. 2nd Plantation ...	50 0	60,000	1st Feb. „	8,963 13 6	8,925 13 10	4½ „	
Do. 3rd do. ...	50 0	67,000	22nd Oct. „	8,462 8 11	8,108 3 5	4½ „	
Do. 4th do. ...	50 0	30,000	12th Nov. 1880.	6,743 5 1	1,658 4 7	9 „	
Do. 5th do. ...	100 0	50,000	1st „ 1881.	7,448 12 0	1,564 2 6	9 „	
Total ...	300 0	307,000	...	46,260 3 6	30,595 12 1	...	
Allipuram 1st Plantation ...	18 74	5,270	...	8,757 7 2	8,450 10 5	9 feet.	All the large trees in this plantation were felled and utilized for famine camps.
Do. Additional Plantation.		5,000	1st Nov. 1878.			6 „	
		1,671	1st „ 1880.			6 „	
Do. 2nd do. ...	20 0	9,000	1st „ 1881.			9 „	
Total ...	38 74	20,941	...	8,757 7 2	8,450 10 5	...	

Iskapalle Plantation ...	19	48	3,161 200 139	... 1st Nov. 1878. 1st Jan. 1880.	895	3	1	834	14	11	6 feet. 6 „ 6 „		
Total ...	19	48	3,500	...	895	3	1	834	14	11	...		
Total for Nellore Taluk ...	538	22	463,441	...	78,765	4	4	51,406	4	9	...		
Atmakúr Taluk.	A.	C.			RS.	A.	P.	RS.	A.	P.			
Mamuduru	10	64	1,000	Not known	...			...			6 feet apart.	Two thousand trees were planted here in 1868, and all these, with the exception of 50 scattered trees, were cut down for famine purposes. Subsequent to the famine years the present young trees numbering 1,800 have been planted with a yearly expenditure of Rs. 96. The actual expenditure incurred cannot now be ascertained.	
			300		...			...			6 feet.		
Pullanellapally	1	16	500		...			...			9 „		
Total ...	11	80	1,800	...	...			...			...		
Total for Principal Division.	*1,535*	*23*	*1,361,689*	...	*2,03,390*	*4*	*11*	*1,35,408*	*14*	*0*	...		
Kávali Taluk.													
Tummalapenta No. I ...	19	76	100 100 100 100 100 100 121 278 13,389	1874 ... ... 1878 1880 1874	6,553	0	0	6,531	8	2	3 yds. 2½ „ 2¾ „ 1 „ 1½ „ 2 „ 4 „ 4 „ 1½ „	These plantations were planted experimentally. Intermediate trees cut.	
No. II ...	33	98	11,232 10,524	1876 to 1878	13,587	11	8	13,303	11	8	1½ „ 2 „	Do. do.	
Total ...	53	74	36,144	...	20,140	11	8	19,835	3	10	...		
Kandukúr Taluk.													
Rámapatnam No. I ...	13	25	7,676	1874	20,182	7	6	20,454	7	6	1½ yds.	Intermediate trees cut (*vide* Sub-Collector's Circular, No. 169, 16th September 1881).	
Do. „ II ...	12	74	6,005	1875							1½ „		
Do. „ III ...	13	17	21,391	1876 to 1877							2 „		
Total ...	39	16	35,072	...	20,182	7	6	20,454	7	6	...		

* Probably about 50 acres.

Statement of Casuarina Plantations with Extent, Number of Trees, &c., in Nellore District—(Continued).

Name of the Village or Plantations.	Extent.		Number of Trees.	When planted.	Amount of Estimate.			Actual Expenditure up to 31st December 1882.			Distance at which the Trees are planted.	Remarks.
1	2		3	4	5			6			7	8
Kandukúr Taluk—(*Contd.*)	A.	C.			RS.	A.	P.	RS.	A.	P.		
Banganapalle	6	0	335	Not known	...			..			...	
Pakala	6	45	440									
Ongole Taluk.												
Kottapatam old tope ...	...		1,164	Not known	...			...			3 yds.	
No. I ...	10	0	11,228	1875	19,195	0	0	14,885	1	2	1½ „	Intermediate trees cut (*vide* Sub-Collector's Circular, No. 169, of 16th September 1881).
No. II ...	15	0	12,175	1876							1½ „	
No. III ...	10	0	5,116	1877							1½ „	
Total ...	35	0	29,683	...	19,195	0	0	14,885	1	2		
Kanuparthi near Salt Cutcherry.	5	53	971	1873	17,138	6	7	16,676	6	7	3 yds.	
North of the platform No. 2.	...		54									
East of the platform No. 1.	198	30	8,529									
New plantation	6	85	4,000	1877							1½ „	
West of the platform No. 2.	7	30	3,282	1873							2 „	
Puluguvadi tope	4	50	4,302	1873							1½ „	
East of the Canal	1,264	44	11,305 5,503 2,180	1875							1½ „	
Total ...	1,486	92	40,126	...	17,138	6	7	16,676	6	7	...	
Total for Sub-division ...	*1,627*	*27*	*141,800*	...	*76,656*	*9*	*9*	*71,851*	*3*	*1*	...	
Grand Total ...	3,162	50	1,503,489	...	2,80,046	14	8	2,07,260	1	1	...	

N.B.—It will be seen from the items printed in italics that the outlay incurred on the trees planted in the Sub-division is quite disproportionate to the expenditure on the trees in the principal division. But this is to be explained by the fact that the former were planted and upkept till lately by the Salt and the Sea Customs Department. They were transferred to this department, some in 1877 and others in 1882.

KUNDRUM,
25th February 1883.

(Signed) SOMASUNDRUM,
Wood Overseer.